AMERICAN MACHINIST

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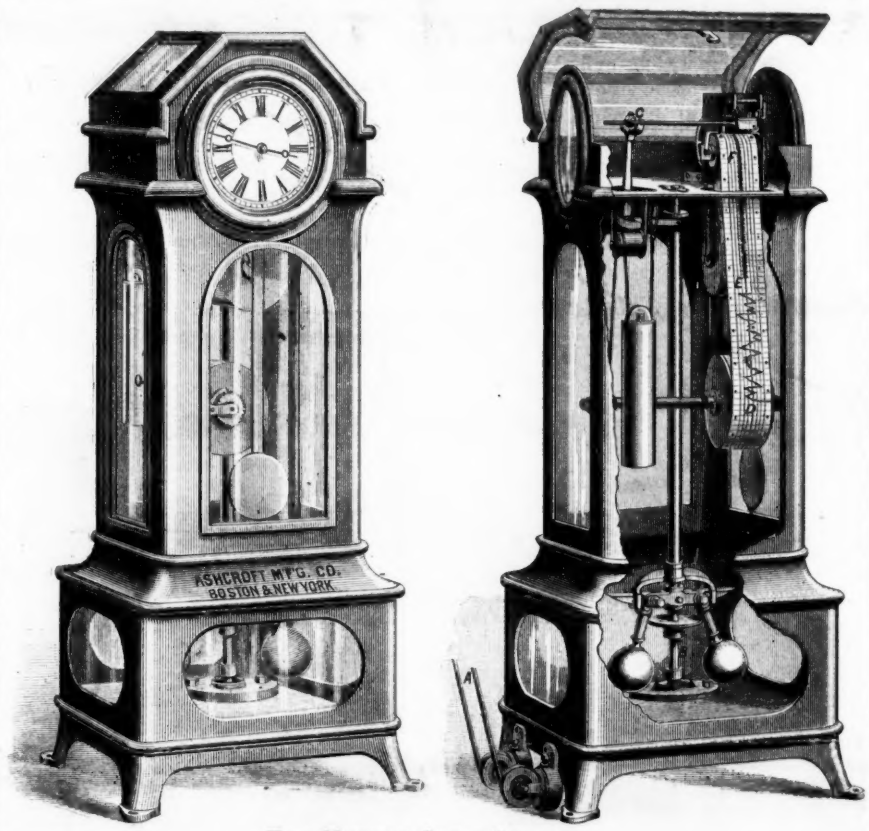
The Moscrop Continuous Speed Recorder.

To secure a continuous speed recorder, which will perform all the desirable functions required of it, would, upon the first impression, seem to necessitate a complication of parts, but from the engravings presented herewith, the reader will readily understand how all desirable ends are fully attained by a very simple arrangement of a few parts.

These engravings represent the Moscrop Continuous Speed Recorder, as made by the Ashcroft Mfg. Co., 111 Liberty street, New York, for giving an accurate and continuous diagram of the speed of the shaft to which it is attached. This diagram is drawn upon a continuous roll of paper, and shows all variations from a standard speed from the time of starting the engine until it stops. Each of these variations appears upon the diagram at the exact hour and minute at which such variation occurred, the paper of the diagram being ruled and spaced for that purpose. This apparatus consists simply of a cast iron case, within which is placed a Howard eight-day clock movement. The case has glass slides through which the internal arrangements may be readily inspected without being in any way exposed to dust and dirt. The two paper rolls, upon which is wound the paper band for taking the continuous diagram, are placed as shown in the sectional view with a *fac simile* of the diagram upon it, illustrating the manner in which it is taken. The weight suspended within the case is for driving the clock movement as well as the paper rolls. The marks made upon the paper, constituting the diagram, are made by an inked marker brought into contact with the paper upon the top of the upper roll. This marker receives its motion from a sleeve upon the upright shaft *B*, located in the center of the case. To the bottom of this shaft a two ball pendulum governor is attached, so that in raising and falling a corresponding movement is communicated through the bell crank *C*, to the inked marker. The governor is very neatly and carefully made, so that the slightest variation in the speed of the same will cause a perceptible movement of the inked marker.



THE MOSCROP SPEED RECORDER.

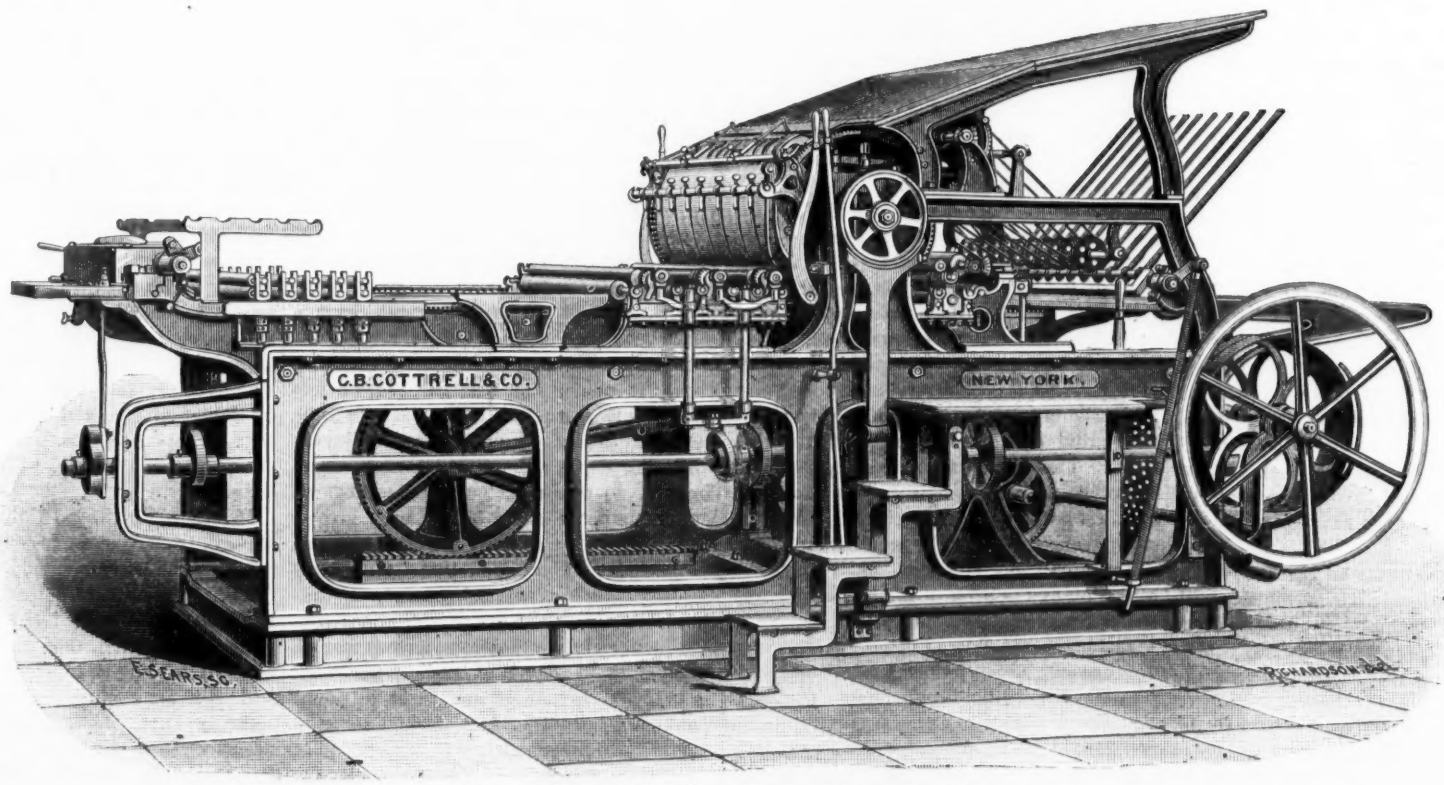
Motion is communicated from the shaft to be tested by a round belt *A*, running around two idlers at the bottom of the case, which changes the direction of the belt, thence around an 8″ groove pulley upon the bottom end of the governor shaft *B*. This shaft is required to run at a speed of 90 revolutions per minute, so the pulley placed upon the shaft to be tested must be proportioned accordingly. When the engine has been started and the standard speed attained, the inked marker will move to a position over the center line *D*, upon the paper. Any variations either above or below this speed will be marked as shown.

The lines of the diagram from *D* to *E* show a record of a very uneven speed, while from *E* to *F* is a diagram which would be obtained from a very uniform speed. Every three per cent. variation in the speed compels the inked marker to move over one space from the line *D*.

When the machinery stops, the inked marker is moved entirely off the paper. During the stop no record is made, but the paper moves on. As soon as the machinery again starts the inked marker moves upon the paper, and begines a new diagram. The quantity of paper placed upon the roll at one time is sufficient for a run of three months, allowing working days to be of the usual length. Diagrams, of course, should be filed away for reference.

Improved Lithographic Power Printing Press.

Although the art of lithography, or printing from stone, has been practiced for years, it is only until recently that the lithographic power press has been brought to such a state of perfection as to enable the desired ends of both excellence and rapidity of work to be attained in its use. To such an extent has the process been improved by the adaptation of machinery, that the comparison must be made as between printing, only a few years ago, from small stones at the rate of a few hundred impressions per day, with the present practice of printing on stones of the size of the largest letter-press forms, and at a speed of 1,000 impressions per hour.



COTTRELL'S IMPROVED LITHOGRAPHIC PRINTING PRESS.

The engraving presented with this represents an improved lithographic power press,

manufactured by C. B. Cottrell & Co., of No. 8 Spruce street, New York City, and No. 112 Monroe street, Chicago.

The principles of construction embodied in this machine are similar to those of the ordinary stop-cylinder press manufactured by this firm, with, of course, such alterations and additions as are required to adapt it to the altered conditions of the work. The stone is substituted for the letter-press form, and is readily adjustable for the variable thickness of the stones used. The adjustable mechanism, while it is of a character to support the stone very rigidly—an essential feature—is also capable of being readily and minutely adjusted to regulate the impression, which in this style of press is done entirely from below, leaving the vertical position of the cylinder unchanged.

The driving shaft, at the end of the machine, is provided with pulleys of large diameter, for the driving belt, and runs at a quick speed, so that the driving is strong, and a fly-wheel of only moderate dimensions is required to preserve a regular and steady motion. The end of this shaft opposite the driving pulleys is fitted with a moderately small spur pinion, which gears with a large wheel on a second shaft, underneath the machine and near the end. This shaft is provided with a crank, from the pin of which a connecting rod with a forked extremity communicates motion to the roller gear, seen under the machine, which in turn gears with a rack on the bottom of the bed, and reciprocates the latter. This connecting rod is of substantial structure, and is fitted with approved adjustable boxes to compensate for wear.

The driving shaft also communicates motion to a longitudinal shaft, by means of a worm or tangent screw on the former, running in a worm wheel on the latter. This longitudinal shaft is provided with cams for vibrating the rollers, and for other purposes.

The impression cylinder is fitted with a gear wheel, with teeth on its entire periphery, with the exception of a few inches where the surface is cut away below the bottom of the teeth. A rack on the bed meshes with this gear, and revolves the cylinder one revolution during the forward motion of the bed. This revolution of the cylinder brings the part of the gear upon which there are no teeth next the rack, and consequently throws the rack and cylinder out of gear. At exactly this time the teeth on the upper end of a vibrating lever, to which motion is imparted by means of a cam on the crank-shaft, engage with corresponding teeth on the cylinder against, but to one side of the open space in the gear just referred to. This at once arrests the motion of the cylinder, and simultaneously a friction, operated from the longitudinal shaft by a knuckle joint connection, engages the surface of the friction wheel, shown at the end of the cylinder near the top and at the front of the engraving. This friction assists in holding the cylinder immovably, and in a position with the blank space of the gear against the bed rack, in which position the bed is free to make its return stroke, the cylinder remaining stationary.

During the forward stroke the impression is made, the cylinder being cushioned with rubber for about one-half its circumference to prevent injury to the stone, the rubber cushion projecting considerably above the general surface. On the return motion of the bed, the general and lower surface of the cylinder is towards the bed, which provides for the return of the latter with the stone out of contact with the cylinder, and without the necessity of raising the latter from its consequent rigid and exact position, or the use of the machinery necessary to its accomplishment.

During the time the impression cylinder is stationary the printed sheet is delivered to the fly, and another sheet is adjusted. The length of time which the cylinder remains stationary affords ample opportunity to arrange the sheet, which is adjusted to guides and points on both the cylinder and feed-board, and is not closed on by the grippers until instantly before the forward or printing stroke of the bed. The time at hand for the purpose, and the excellent means of adjustment, together with the fact that the bed and the cylinder have exact corresponding motions, provide for accurate register.

When the bed arrives at the end of the return movement, with the crank passing the center and the motion of the bed at its slowest point, the vibrating segmental lever referred to is operated to throw the cylinder around sufficiently to gear with the bed rack, the friction is moved out of contact with the friction wheel, and the bed and cylinder are gradually started for another impression.

From the water reservoir, immediately behind the impression cylinder, the wetting rollers are automatically dampened, the exact degree of dampness required for varying conditions being readily gauged by the pressman. By similar appliances the proper delivery of ink from the ink fountain is provided for, all the mechanism for both ink and water delivery being unvaryingly operated from the motion of the press, and subject to accurate control. The side rack of the bed is connected through pinions with the distribution rollers, by which correct distribution is accomplished, and the form rollers also have positive motion, and are provided with adjustable bearings to regulate their pressure on the stone.

A throw-off movement is provided, by the use of which the cylinder can be held stationary during any number of reciprocations of the bed, so that for special work, the stone can be rolled as many times as desired before taking the impression.

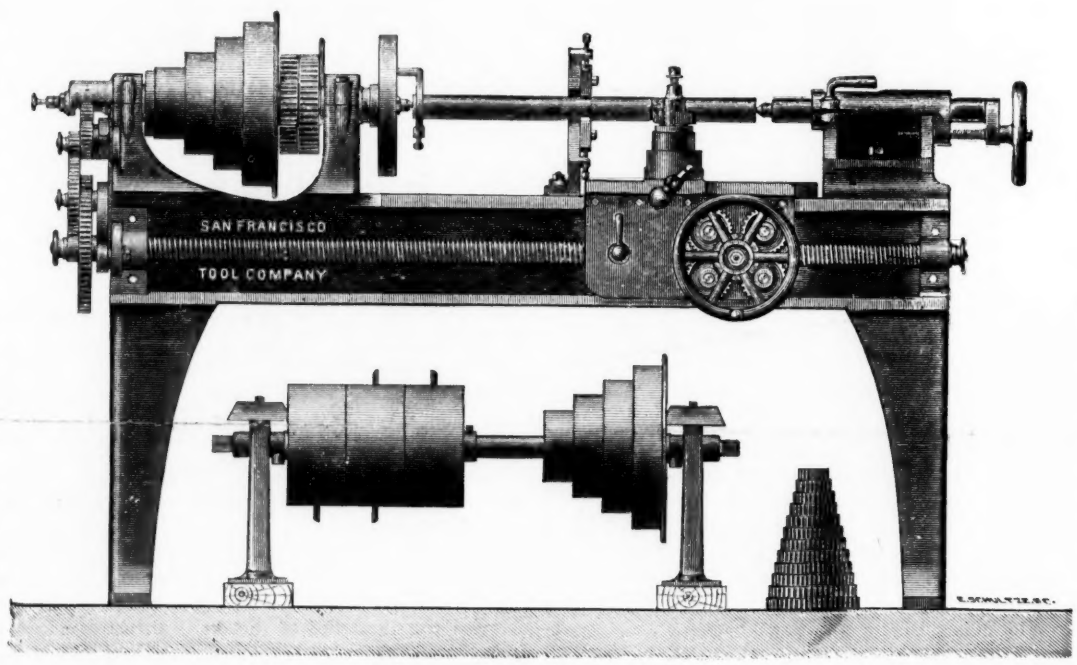
It will be seen that the essential motions of this press are arbitrary and positive in their character, the close and rigid connections providing for their exact relative occurrence. The crank motion accomplishes the stopping and starting easily and without jar, and with the utmost precision, while the strong construction and general character of stability prevents vibration, and renders the operation of the press at the highest rates of speed comparatively noiseless.

The mechanical detail is well worked out, the needed strength being attained with pleasing forms and arrangement. The construction is simple in character, and the disposition of parts, including the stone, such that they may be readily come at for adjustment and inspection.

William H. Hoffman, who recently took the position of Superintendent of the Hartford Engineering Co.'s works, is conducting affairs in these shops in a manner highly satisfactory, not only to the proprietors, but also to the foremen and workmen.

Sixteen Inch Swing Engine Lathe.

We present with this an engraving of a 16-inch screw-cutting lathe, built by the San Francisco Tool Co., San Francisco, Cal. It will be seen that this lathe has some features not common to American built tools, amongst which are the flat carriage ways, the outside carriage gearing and outside screw for tail spindle. This lathe is strongly geared and driven, and is capable of doing heavy work for a lathe of the size. The cone is made for a 2½" belt. The feed is operated by friction, with no chance for interference between the lead screw nut and the feed gearing. No backing belt is required for cutting screws, and only one wheel is changed in cutting from 5 to 18 pitch. The engraving is made to a scale of ¾"=1 foot, which will permit various dimensions to be measured.



SIXTEEN-INCH SWING LATHE.

Unequal Changes of Lathe Speeds.

BY J. E. MCCONNELL.

The driving belt of an engine lathe is shorter lived than that of any other machine tool. The reason is not because so much work is required of it, but because it is subjected to very slow speed—about 8 or 10 times the cutting speed. When the kind of work engaged upon requires the removal of a large amount of metal, it sometimes becomes absolutely impossible to do a creditable day's work without keeping the driving belt strained to such a tension that the lacing occasionally breaks, or the holes tear out, or the belt is stretched out of shape and "flops" over on the other side on one pulley or the other, often turning two or three times, resembling a twist drill or an auger.

A 2-inch belt on a planer will drive a heavier cut than a 3-inch belt on a lathe, the cutting speeds being the same. This is because the planer belt will run several feet while the work runs an inch; and the lathe belt will probably run 8, 10 or 12 inches while the surface operated upon turns an inch. Why not use larger cone pulleys on lathe spindles, thereby obtaining a greater belt speed and a proportionately less strain on the belt? There is nothing to prevent the largest pulley from being nearly or quite the size of the full swing of the lathe; thus a 24-inch swing lathe may have a 22-inch pulley at the large end of cone. This would probably be such an improvement in power that such a lathe would be looked upon as a giant for pulling a cut.

A great fault in many lathes lies in the unequal change of speed at the time the back gears are thrown in or out of gear. Here is the result of some study on three engine lathes, with this fault built into them.

The first was a 24" lathe, 8 speeds. This lathe was built less than three years ago by a prominent builder.

	Rev. per min.	Ratio between two adjoining speeds.
Back gears out	247.40	
	146.24	1.69
	90.42	1.69
	53.45	1.69
Back gears in..	18.88	2.83
	11.16	1.69
	6.90	1.61
	4.08	1.69

The second lathe was a 32" or 34" swing, since raised to 44", and has 8 speeds. This is a superior lathe in many respects, yet when we change to or from the back gears we have more than double the change of speed that we have elsewhere. It was built in a Massachusetts town, probably eight or ten years ago.

	Rev. per min.	Ratio between speeds.
Back gears out	138.54	
	95.69	1.45
	66.89	1.43
	46.20	1.45
Back gears in..	12.47	3.70
	8.61	1.45
	6.02	1.43
	4.16	1.45

The third lathe is a 50" swing with 10 speeds. With no speeds between 7 and 36 revolutions per minute, one can see how well it is adapted to work of 4 or 6 inches diameter.

	Rev. per min.	Ratio between speeds.
Back gears out	98.71	
	76.67	1.29
	60.00	1.28
	46.96	1.28
	36.47	1.29
Back gears in..	7.15	5.10
	5.55	1.29
	4.34	1.28
	3.40	1.28
	2.64	1.29

I have been told that this is a home-made lathe, and was built in Pennsylvania not a very long time ago, when we speak of the age of a lathe.

I know of a 22" lathe in which the fault lies in the opposite direction. In this lathe, when a change is made to the back gears for a slower speed, the reduction is scarcely discernible without the aid of a microscope.

Lathes should have a much greater range of feed than is given them. I believe they all have fine enough feeds, but when we attempt to shave a mandrel, or finish a pulley with three or four turns to the inch, we are obliged to feed by hand, or with the lead screw.

"H. C. B." is on the right side (and there are only two sides) when he advocates balancing handles that are intended to operate a feeding device. Balance the dead spindle handle and handles operating cross feeds. Ball handles are to be preferred for moving the carriage by hand, and for cross-feed screws.

When it is desired to hold the carriage firmly, as in cross-feeding or surfacing, it should be locked or clamped directly to the bed or rack by simple means, and not rely on locking the train of gearing in the apron. The New Haven Mfg. Company do this, by tightening one of the holding down gibs with a screw which extends up through a wing of the carriage. This a good and simple way.

In regard to ways, I think two large V ways in front, one for carriage and one for tail stock, and entirely plain and flat behind, the best. Nothing will run the carriage in line like a V way. I agree with Oberlin Smith in the belief, that we will have in the near future engine lathes with much larger and stiffer spindles. When these lathes come into use, we can take one which has been accurately fitted and adjust the spindle in its bearings while dry, so that there will be a perceptible shake, then without readjusting apply a good lubricant, and we can do a smooth, straight, stiff job, with the spindle running on oil only, the metals standing apart. This kind of spindle, in stiff housing, will run at a pretty good speed without heating, if taken care of. When

there are 12″ engine shafts running 200, and 4″ saw shafts running 500 revolutions per minute, it would be strange if large lathe spindles could not run fast, occasionally, without heating and sticking.

The proper place for the lead screw and its appendages is in front, being nearer the work, and more readily manipulated and seen. With the present system of screw cutting its pitch should be two or four threads to an inch.

All screw heads and nuts on the lathe and steady rest, which must be occasionally moved, should fit the lathe wrenches, or "screw keys," as our English friends call them.

Why don't somebody build a shafting lathe in which the shaft to be turned is fed through the hollow spindle or spindles? No centers required; no tail stock; short bed; will turn a mile long.

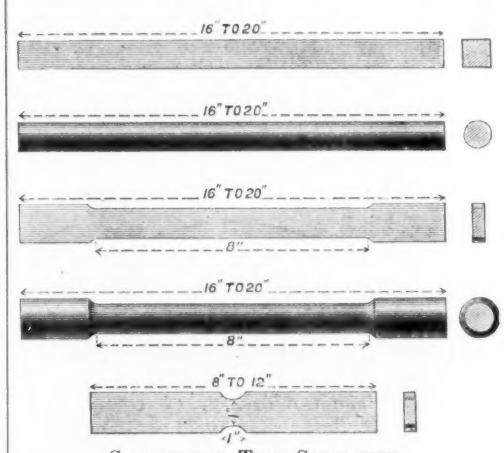
Nail-Makers in the Black Country.

The free trade theory is that everybody should be allowed to buy where he can buy the cheapest, with no artificial restrictions created by law. Unquestionably nails, as well as pig and bar iron, can be bought cheaper in England than in the United States. The transportation across the Atlantic costs but little. In some instances, when the freight offered is light, pig iron is brought over to this country *free*, for ballast. The condition of the nail makers in Great Britain is somewhat interesting, in view of a proposed reduction of the tariff.

If the protective principle is abandoned, or in other words, if "tariff reform" is carried to the extreme demand by its most enthusiastic advocates, we must expect that our iron workers can obtain but little, if any, greater wages than those engaged in the same occupation in Europe. The following article from the *London Standard*, a good English authority, we find copied without comment, by the New York *Evening Post*, an ardent free trade newspaper:

About 24,000 people are engaged in this dismal part of Great Britain (the Black Country), in making nails and rivets. It would not be so much a matter of surprise, even for the lowness of the wages that they earn, if they were all men and youths who are engaged in the industry—one of the very worst paid in any part of the country. But it so happens—and here arises the social degradation of the traffic—that there are at least 16,000 females engaged day after day in the occupation. They are not all mature women either; daughters work by the side of mothers—daughters who, in their tender years, ought to be either at home, if they have any home, or in bed, instead of working their weary arms in shaping, in the still small hours of the morning, molten iron into the form of nails for the benefit of what are called the "foggers." Here is a picture of what may be seen any night in this district—except, perhaps, Saturday nights. In the middle of a shed which adjoins a squalid-looking house there is a whole family at work in the production of these nails; father, mother, sons and daughters—daughters, too, very young in years, but with that sad look of premature age which is always to be noticed in the faces of child-workers. The gayety of youth, its freshness and its gentleness, seem to be crushed out of them. In the center of the shed, with its raftered ceiling—a black and wretched building, through the walls of which the wind readily finds its way—there is a "hearth," fed by "gledes" or breezes. Probably there is a girl or woman blowing at the bellows, while the strips of iron from which the nails are made, become molten. Or, to take an actual case, witnessed by the writer a few nights since, close upon midnight: In one of these forges were a mother and several children. The mother was a woman probably forty years of age; her youngest daughter—a flaxen-haired girl, with a sweet and winsome face—was certainly not more than twelve years of age. By the side of the hearth there was what is technically called the "Oliver"—a barrel-like construction, on the top of which is fixed the stamp of the particular pattern and size of the nail required to be made. The workmen and workwomen, by means of a wooden treadle—an industrial treadmill it ought more strictly to be called—shoot out the nails from the slot in which they are fixed. They have previously hammered the top of the incandescent metal, with masculine firmness, so as to form the head of the nail. The women and the girls seem to work with more vigor than the men—very often, indeed, they support their husbands and their fathers, who may have fallen into drunken habits; in other cases, this nail making is a means of supplementing the husband's wages.

But what do the nail-makers earn a week, may naturally be asked? The remuneration they receive is incredibly small. It is no unusual thing—on the contrary, it is rather the usual custom—for a family of three or four persons, after working something like fourteen hours a day, to earn £1 in a week. But out of this money there has to be deducted 1*s.* 3*d.* for carriage to convey the nails to the "gaffers," as they are termed in the district; then there is allowance to be made for fuel and the repairing of the machinery, which reduces the £1 to about 16*s.* 9*d.* for three people—for three people who have commenced to work every morning at half-past 7 or eight o'clock, and who have worked on through all the weary day, with no substantial food, until late at night. Who is it that reaps the benefit of all this terribly hard work? Certainly not the laborers; for it is a well-known fact that that they rarely taste meat from one week's end to the other. In the expressive but simple language of one poor workwoman, this is how they fare: "When the bread comes hot from the bake-house oven on Saturday we eat it like ravening wolves." The "foggers," or "Tommy shop" men live lives of contentment, profit, and rest at the expense of the poor nail-workers. The "fogger" is an intermediate agent between the worker of nails and the buyer. Out of the bone and sinew of these poor people he makes a very fine living—and he does not work. He has a huckster's shop attached to his dwelling; he supplies, at the beginning of the week, the nail-workers with their sixty pound bundles of iron, and when they return the bundles of iron in the marketable shape of nails—out of which he makes at least twenty per cent. profit—it they do not buy his high-priced provisions, they get no more work from him. These are the men who, by cutting down the workmen's wages to starvation point, are at the root of the evil.



SHAPES FOR TEST SPECIMENS.

Testing Constructive Materials.

The importance of testing the strength of constructive materials is coming to be generally recognized, as tending by no means to safety alone, but as well to economy in their use. For obvions reasons the majority of those that use such materials do not have the means of properly testing them, hence test pieces are sent to those who are provided with the necessary mechanical appliances, from whom a record is obtained that governs future use.

As of some assistance in preparing test pieces, we present the accompanying engraving of shapes for tensile tests, for the use of which we are indebted to Messrs. Kent and Zimmerman, of the Pittsburgh Testing Laboratory, 91 Fourth avenue, Pittsburgh, Pa. The length of the pieces should be between the extremes given, and the area of cross section such as to break at a strain not exceeding 50,000 lbs. The two upper figures show a square and round bar as rolled. When these are of spring or tool steel, a sectional area of about $\frac{5}{8}$ square inch, or $1\frac{1}{16}$″ diameter, is recommended. For softer steel, and wrought iron, .44 square inch, or $\frac{3}{4}$″ diameter. When the test pieces are of cast iron, or weaker alloys, or of wood, leather, or comparatively weak substances, the sectional area may be .785 square inch, or 1″ diameter. The third and fourth figures (from the top) show the standard shape for round and flat pieces. The edges should be true and smooth, and the fillets $\frac{1}{4}$″ radius. The lower figure represents the requirements of the U. S. Government for test pieces of marine boiler plate, but is not recommended except to meet these requirements. In other instances the form shown in the third figure from the top is preferred. The ends of any of the pieces shown should not measure over $2\frac{1}{4}$″ in width.

For compression tests of metal, 1″ long and $\frac{1}{2}$″ diameter, ends perfectly square, is recommended. For stone and brick, a 2″ cube. Transverse test pieces should not be less than 1 foot, nor more than four feet in length.

Mental Training in the Shops.

BY FRANK H. RICHARDS.

There are considerations other than merely technical ones which have weight in determining the quality and quantity of a man's work in the shop. For instance, what is distinctly and pre-eminently the mark of the superior workman? I would unhesitatingly put it as self-respect. The good workman *justly* appreciates his abilities; and this self-appreciation is as far as can be from unwarranted and inordinate self-conceit. A man in a machine shop, like a man anywhere else in life, who knows how to do good work, knows well enough when he does good work, knows as well as anyone the value of it, and cannot be got to willingly waste it. Work that is wasted is never good work nor done by a good workman. Work may be like choice butter upon good bread, or it may be like the same butter daubed upon the sleeve of your best coat, and then it is not good work. Troy is the great laundry city—put tight fits upon work that is to encounter the rust of a wash-room, and it will bring you profanity instead of praise. The most worthless man in the shop is he who is willing to swing his axe all day and see no chips fly. The man who is in earnest makes every motion tell to the accomplishment of his purpose. He is the man whom I may always safely tell when anything about his work is wrong. He will know that he is precisely the one who should know about it, that he may correct it and avoid a like mistake in future.

The tool-acquiring instinct is an almost unfailing mark of the good machinist, and the lack of it in a young one is a fatal and hopeless symptom. By the term tools we must cover far more than the rule, square, calipers, and articles of that character. Whatever will facilitate the work entered into may be called tools, all the training of eye and brain, as well as that of the hand, the seeing and thinking which precede the skillful doing, the planning of means and methods in advance of the moment of execution. Among valuable facilities to a man may be reckoned a knowledge of all the dimensions and movements of the lathe or other machine he operates. I have seen a man who has run a certain planer for ten years, and who does not to this day know how far a turn of the crank will raise his cross-head, and when making a change he usually has to stop and apply his rule two or three times before he gets to the right height. Another has to run a drill a certain distance into a piece that he has in his lathe chuck, and to make sure, he gets a file and cuts a notch in the drill, instead of knowing the pitch of the tail screw and counting the turns of it, which would do the work with greater accuracy. I verily believe that I am disposed to be kind and helpful, and am not lacking in patience, but I have very little of it to waste upon the fellow "learning the trade" who expects to be told every detail of it. He wont have the trade learnt in a hundred years. Only a week or two ago I scolded as sharply as I knew how a young man who has been in the shop three years, and who did not know how to adjust the stroke of a shaper. "Nobody ever showed him how;" why, nobody ever showed me how, and he had as good facilities for learning the matter as I had. I mention this with impunity, as he is not one of those who read the AMERICAN MACHINIST.

The trade becomes continually less and less manual. There is less pushing the file and swinging the hammer. Muscle is at a discount and brains are far above par. One who expects to become a machinist without mental training had better step out. One is never learning anything unless he is in trouble. If I got hold of a bright and ambitious young man and wanted to push him, I would keep him in hot water all the time. There is a power of virtue in hot water.

Akin to the tool-acquiring is the tool preserving instinct, of which I want to speak more fully than I can at the end of this. It is a great point to have tools always in order, always in place and in a handy place, everything not wanted out of the way, and ones surroundings roomy and comfortable. We rise by opportunities, and they are few and far apart, and he whom the opportunity finds equipped and alert is the one to mount and master it.

The New York City Board of Aldermen recently passed a resolution, unanimously, which declares that a growing public opinion demands the abolition of the contract labor system in penal institutions, which has proved detrimental to the interest of the honest working class of our citizens by bringing the products of convict labor in direct competition with that of the free artisans. The resolution directly requests the legislature to pass such laws as will, "if possible, entirely abolish this infamous system, by which the prisons of this State have been prostituted from the legitimate objects for which they were erected into money-making concerns for the enriching of a few favored monopolists to the injury of manufacturers and mechanics outside of prison walls."

In the course of time (not a very long time either) State legislatures will probably learn the wishes of the people upon this industrial problem.

A meeting of the National Stove Founders' Association will be held in New York, February 7, 1883.

The Commissioner of Public Works of Brooklyn, N. Y., announced that in consequence of the decline in the price of pig iron, there is a probability that the cost of constructing the new Eastern District water main will fall $25,000 below the original estimate.

The American Society of Civil Engineers met in New York City, January 17th. Several interesting papers were read and discussed. Excursions were made by the members in a body to places of engineering interest in the city.

The following officers were elected for the coming year: President—Charles Paine; Vice-Presidents—William H. Paine and Henry Flad; Secretary and Librarian—John Bogart; Treasurer—J. James R. Croes; Directors—George S. Greene, Jr., Joseph P. Davis, William Metcalf, William E. Merrill, and William G. Hamilton. A Committee on Uniform Standard Time approved the action of Congress in authorizing the President to summon an international meeting on the subject, and recommended that a convention be called as soon as possible for determining a standard time for North America. It was decided by the society, if, after communication with other scientific bodies, it was deemed advisable, to send a petition to Congress to call such a convention.

The National Association of Stationary Engineers is rapidly extending its membership. Recently a local Association was established at St. Paul, Minn., and others are about to start in Hartford, Conn., Columbus, O., and probably San Francisco, Cal. The President, Henry Cozens, writes us: "We will no doubt, before long, enroll every State in the Union."

Details of Engine Lathes.

BY OBERLIN SMITH.

In a recent article upon lathe spindles, and how the designing of them appeared, in many cases, to have a benumbing effect on otherwise wide-awake intellects, the writer proposed such a radical enlargement of diameters as to introduce certain new difficulties, the method of overcoming which may here be discussed.

In diagnosing the case and its symptoms let us assume that we have our old patient, the 20″ lathe. Having given it an enormous amount of "backbone" to support, in the shape of a live spindle with its right journal (say) 7″ in diameter and a left one 3½″, we might discover that the smallest pulley of the spindle cone was of but little, if any, greater diameter than the largest journal—that is, if the usual practice in designing cones was followed. Under these circumstances the thing would probably revolve, because the lateral (upward) pressure of the belt would occur at a point near the small journal, and the friction of the oiled metallic surfaces would not be as great as that of leather and iron, but there would not be a great surplus of power left for doing cutting work. The practical minimum size for this pulley, in proportion to the journals, can best be determined by experiment, as we have no data to consult regarding driven pulleys, which are smaller than their shafts. It is clear, however, that the pulleys must in this case be made larger than they are with the usual small spindles. Probably the lathe in question would work well with the small pulley 9″ or 10″ in diameter. This, with the larger pulleys of the cone in proportion, the old school designers would object to, because they would have to cut down the sides of the "live-head" low, and thereby lose the important bracing which they now give to the delicate structure that stands up at each end of the head to support the journals. It may be interesting just here to mention that a lathe-maker of excellent repute, dwelling in the immediate vicinity of William Penn's "only headquarters," makes a good, solid looking (by the old ideas) live-head, and takes the trouble to core out the upright parts, nearly up to the bottom of the journals, leaving them mere shells perhaps ½″ or ¾″ thick. Whether the few shillings worth of metal thus thrown out is for the benefit of the worthy guilds of pattern-makers and moulders, by creating a larger demand for their labors, or whether this membranous construction is intended to develop a "*vibratory force*," in opposition to its true and only inventor, is as yet an unsolved connundrum.

The matter of connecting and bracing the upright parts of the head can easily be arranged by throwing further out the side "webs," which connect the two uprights, allowing the cone to be partially down between them. If it is objected that this makes the head (and consequently the bed and carriage) too wide, let it commence to be wider at a point above the carriage, and swell enough to clear the cone—leaving it at the bottom as narrow as usual. This, however, is in case the designer wishes the bed of the ordinary width. A considerable amount of widening is, in the writer's opinion, of no detriment to the machine. In the short, heavy 20″ lathes referred to in a former article he made the head (which was cast in one piece with the bed) wide enough for the back-gearing to be entirely within it, directly *below* the spindle. This arrangement seems, so far, to work very nicely; it allows the side webs of the head to run up nearly to the center of the cone. Their outside width is 16″, and the extreme width of the bed 20″. The latter is perfectly flat upon the top, with a large bearing surface for the large and heavy carriage. All this, of course allows for plenty of the "anvil-principle" in the various parts.

For another reason, besides the presence of a large spindle, should the cone-pulleys of a lathe he made as large in diameter as it is possible to contrive them, namely, to obtain a higher belt speed—a point that is shamefully neglected in almost all machine tools, except planers.

There is but one objection to fast-running pulleys of large diameter, and consequently heavy weight, upon lathes and other machines which must be started and stopped frequently and suddenly. This is their inertia—using the word in its sense which includes momentum. Even with the small cones generally used, there is time wasted in stopping the lathe when it is running at the fastest speed. The usual remedy adopted by the machinist who feels in a hurry, and doesn't want to "nurse his job," is to use the palm of his hand, as a brake, upon the largest pulley or the teeth of the large gear. This helps to keep them clean and bright (the iron, not the skin) but still takes too long in stopping. The starting also occupies too much time, but the pleasant little squeak frequently accompanying it makes things seem cheery like—and tests the quality of the belt oftener. These difficulties are, as before stated, aggravated by the use of very large cone pulleys and other revolving parts. The trouble becomes still greater if the driven pulleys upon the countershaft are made much larger, which increase I hope to have the pleasure of advocating anon, when treating countershafts in general.

The principal difficulty, that of stopping quickly enough, may be easily obviated by a simple self-acting brake arrangement, attached to the shipper and operating against the upper cone pulley. A better plan, although involving a more radical change in construction, would be to have some good clutch arrangement (either frictional or otherwise) upon the spindle itself, by which to disconnect it from its large gear. This would practically eliminate the factors of inertia and momemtum; would enable the spindle to be either stopped or started instantaneously; would bring the operating handle down to a convenient position; and would make the machine complete in itself, that is, as far as delicately working parts were concerned. An ordinary shifting belt could be used to stop the countershaft, when out of use, if desired. Having anticipated all objections that may probably be made to the enormous spindles recommended (I do not consider the loss of power by increased friction at all worth mentioning, in view of the advantages gained). I will briefly hint at a few other points in regard to which the lathes of our day need improving. The most vital reforms necessary have been fully pointed out in this and two preceding papers—viz, excessive weight, and consequent inertia, in all sfationary and slowly moving parts; very large live and dead spindle; long journal bearings; large pulleys, and consequent high belt speeds; proper methods of starting and stopping, etc.

Beginning with the bed (in treating the other points alluded to) it should be very much deeper than usually built, to avoid deflection by gravity, and should *not* be trussed like a railway bridge or a North river steamboat (not to mention again the frame of a fiddle) to prevent a tendency to sag. The upper and lower ribs should be very wide to prevent lateral spring, and the webs should be connected by numerous cross-stays, to avoid spreading and twisting.

In regard to spreading, it may not be amiss to here relate a bit of the writer's experience, some years ago, when just out of his apprenticeship, in building an "improved" lathe for his own use. He was full of Whit worth-Sellers-istic enthusiasm and thought that if it was a good thing to make the outside edges of the "ways" in "dovetail" form, for the benefit of the carriage, it would be a better thing to make the inside edges likewise, for the benefit of the heads. By a nicely arranged system of gibs and cams underneath the heads, they were made to fit snugly, and all the wear of the dead-head was to be taken up as fast as it "matured." The same arrangement answered, with wonderful convenience, to lock the heads in position. This lathe was 18″ swing and the bed was 12′ long. Its cross-stays were only 12″ apart, were made extra strong at the top, and came up within 1″ of the upper face of the bed—all this being intended to resist the spreading action of the head gibs. A cross-section of this bed is shown in the annexed sketch, Fig. 1. The

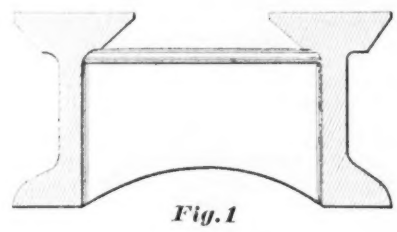


Fig. 1

thing was started up, but its owner noticed about it the slight peculiarity that when the heads were locked fast the carriage was locked also, and *vice versa*.

With a realistic consciousness of the elasticity of cast iron that he had never possessed before, he proceeded to evolve from his brain-molecules (or from them and their motions too?) a temporary milling apparatus, traveling upon the ways with the carriage, and driven by a worm-gear and a high-speed cotton-rope belt. This was necessary because there was no long planer at hand. The resulting

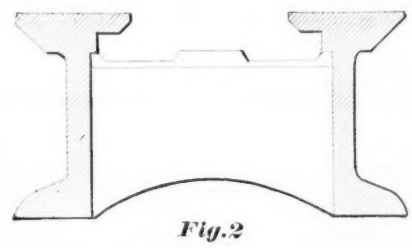


Fig. 2

shape is shown in Fig. 2. The heads were clamped down in the usual way, and the lathe has been doing excellent service ever since. The trouble had, of course, been caused by the actual stretching of the stays; they being too close together, and the heads too long, for any bending between them to be worth considering. The above referred to milling cutter, and its spindle, are shown in

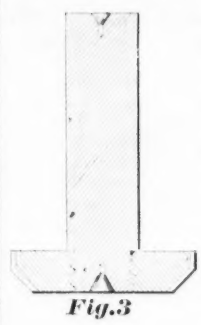


Fig. 3

Fig. 3. After being thus milled out, the bed was, of course, not of the strongest design, but it was the best that could be done to secure a place along which could slide the clamps for bolting down head and steady rest.

The last paragraph is undoubtedly a pure specimen of the genus *digression*, but it may serve as a warning to some novice, and will possibly give a hint regarding a make-shift method of correcting mistakes in cast iron that are not discovered till it has *cooled*.

To proceed with the requisites for our ideal lathe bed (which, by the way, the writer thinks is much better with *flat* than with ∨ top surfaces), it should be so clumsily designed as to resemble, in cross section Fig.

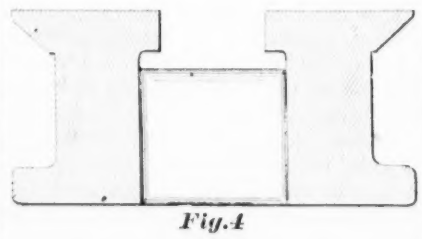


Fig. 4

4, rather than Figs. 1 or 2. The supports of this bed, whether legs or box cupboards, should be broader than usually made (from back to front) at their bearings upon the floor. These bearing points should be four or six in number. The three-legged principle, recently advocated in the AMERICAN MACHINIST, is excellent in theory, but it does not give sufficient stability against forward and backward oscillations, caused by work which is out of balance, etc. This action is likely to take place at either end of the lathe, and therefore it would be difficult to decide *where* to put the single leg, if there were but three. The æsthetic part of the matter would also, I imagine, be somewhat troublesome to arrange, as a long narrow parallelopipedon, like a lathe bed, does not harmonize well with a tripod. If a lathe is set upon as good a foundation as it ought, for other reasons, to be, and a few minutes are spent with the aid of a spirit level in setting it "out of twist," it will be, practically, good enough.

To glance briefly at other parts of this ideal lathe:—the carriage should have a much larger bearing than is usual upon the ways, and the dovetail for cross-slide should be both wide and deep. To suit this writer

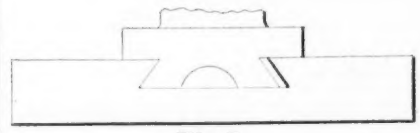


Fig. 5

it should be sunk as in Fig. 5, rather than standing above the general flat surface, as in Fig. 6, both being back views.

This construction is not only stiffer, but it

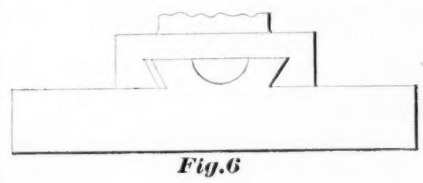


Fig. 6

gives a flat surface on which to lay work, in certain odd jobs of boring, etc.; and also gives more "swing over carriage." The angle of all the dovetails should be 45°. This holds the parts more firmly than the 60° or 70° often used, and yet does not leave the metal with so thin an edge as to cause it to spring or break. The tool-holder should be heavier than usaal, and should have some good elevating arrangement, (if the spirit of Archimedes could be invoked to come down and invent one), which would move vertically, without revolving, *after* the tool was clamped in position. It should, above all, possess the valuable quality of *staying put*.

The sacred precincts underneath the front of the carriage must be spoken of reverently and touched upon tenderly. A touch not quite tender in this delicate region has too often caused the "shop dentist" to work late without his supper, e'en into wee, sma' hours. There are lathes that in these parts are simple and dignified. Why cannot they all be so? Whether partly in this domain, or, more properly, principally out in open sight at the left hand end of the machine, the feed gearing should be so arranged that various finer and coarser feeds can be instantly brought into action—especially the coarser ones. If the operator has to go to the end of his lathe to take off and put on a gear before relieving his conscience of a "scratch-cut," the said conscience will soon be ready for the tragic fate which befell Mark Twain's conscience in Connecticut. The feed gears that do have to be changed, for screw-cutting purposes, should be arranged with a little snap-spring, or some other device, which will allow rapid manipulation. The usual hexagon nut, capable of giving a ton pressure, to hold against a gear which has no tendency to move endwise except by a general jarring action, is too absurd for continued use.

The "back-gearing" should have something which the average lathe maker thinks beneath his notice, viz., a snap of some sort to hold it in gear. This is very easily arranged and saves a good deal of string and old lacers in the course of a year. This gearing should also be protected from getting soiled by mashed thumbs and such like grewsome objects. Simple guards can be placed for this purpose near the points where the wheels mesh.

The dead-head (otherwise yclept puppet-head, tail-head, tail-stock, etc.) does not seem to need as much reform in the matter of strength as some other members of the average lathe. Besides carrying the very

large dead spindle before advocated and being abundantly stiff (though not too heavy) it should possess a good clamping-down device operated by a single motion. It should *not* have the two nuts and wrench, which strange to say, are still known to this generation of machinists. The spindle feed-screw should have a double nut, adjustable for taking up end wear in order that annoying lost motion be avoided. This arrangement should also be applied to the main-feed and cross-feed screws.

Among the minor requisites of a good lathe are all sorts of small conveniences, too numerous to mention here. One of them is being able to measure distances moved by the tool on the micrometer principle. For this it is best to have the pitches of the feed-screws either 1″, ½″, ¼″ or ⅛″, and their collars graduated so as to measure 64ths, and binary subdivisions thereof. All crank-handles should of course be balanced. The connection between the spindle cone and gear should be so made as to be instantly worked with the fingers without using a wrench. The locking or unlocking should not take over one second. Most of the devices mentioned in these last four paragraphs have been in use for fifteen years upon the lathe whose bed is shown in Fig. 2, and have never been out of order for an hour.

Another very important point, but one which must be left for a future occasion, is the making of certain parts of a lathe to certain standard dimensions. Regarding some of these it will be necessary also to ascertain *who* is to establish these standards. Of this, as well as of the countershaft question, more anon.

According to the returns of the New York City Board of Police Commissioners during the quarter ending with the old year, 846 steam boilers were examined, 679 tested hydrostatically and 30 found defective. In the gauges and attachments of 19 others defects were found. The number of applicants for engineer's certificates who were examined was 1,012, of whom 928 passed examination successfully and 84 were rejected.

New Portable Saw Mill.

We illustrate herewith a new portable saw mill, built by Lowe's Foundry and Machine Co., Chattanooga, Tenn. It will be observed that this mill is made much heavier than the ordinary small plantation mills in the market, and possesses many improvements not found on such mills, yet is not so large and expensive as the heavy mill generally used in lumbering districts.

The frame of this mill is composed of iron end pieces, with wooden sides and center piece (as shown in the engraving) securely bolted together. The mandrel boxes are three in number, all cast in one piece, so that it is impossible for them to get out of line; beside, the adoption of a center bearing, which holds the mandrel more steadily and prevents springing. In connection with the frame on which the boxes rest is a device for changing the lead of the saw, which enables the sawyer to regulate the running tendency of the saw while in motion. This is done instantly and without having a single set-screw to slack or adjust.

In sawing thick and thin lumber this improvement is of great advantage.

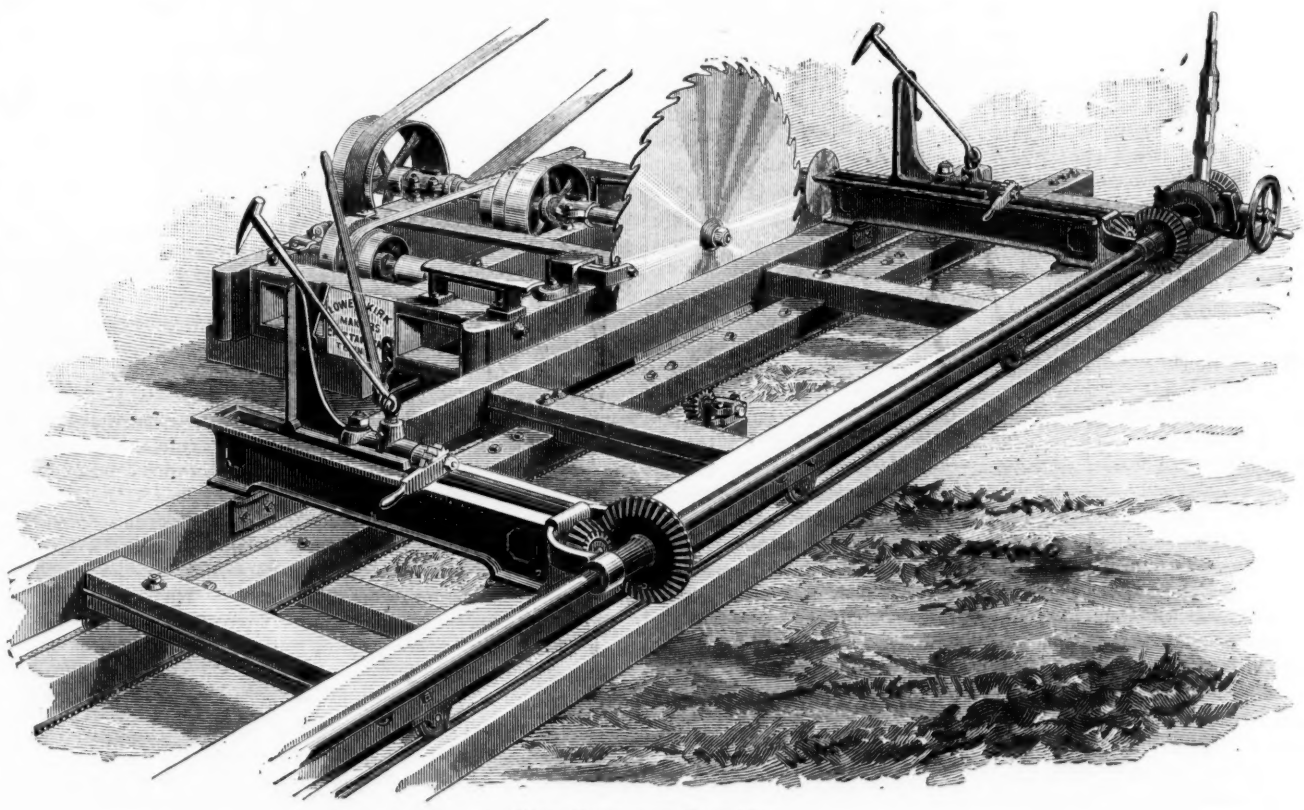
There are often serious accidents resulting from adjusting the common saw guide while the saw is in motion.

To prevent casualties a saw guide is applied, which can be adjusted by screws placed at a safe distance from the saw, as shown.

In front of this guide is a lumber index, which indicates to the sawyer before the saw strikes the log whether the intended thickness of lumber is to be sawed. The parts of saw mills subjected to the greatest wear are the feed and go back machinery. The feed belt in this mill is three inches wide, and the go-back and friction wheels are of pressed paper, with 5½″ face. The cones are so arranged that four changes of speed can be had.

Sawyers place great reliance on good head blocks. This is made one of the chief parts of this mill in point of efficiency and expense. In these head blocks the movement of the knee is regulated to the thirty-second part of an inch. The blocks are simultaneous in their movements, both forward and back, with a quick backward motion. The knees are provided with two dogs each, one of the common kind and one for holding the last board. The carriage is of timber 5½″x6″ and laid with iron where the most wear occurs.

Carriage rollers are 6½″ in diameter, chilled iron, and cast on wrought iron axles. The track way is of wrought iron and double the length of carriage. Journal boxes, in which the carriage rollers run, are so arranged as to hold the oil and exclude sawdust. A top saw and frame are provided for this mill, suitable to carry a saw 30″ in diameter, and so constructed that they can be attached to the mill at any time.



NEW PORTABLE SAW MILL.

The Edgemoor Iron Company, of Wilmington, Del., have completed their contract for furnishing material for the superstructure of the Brooklyn Bridge and have fully closed the transaction. The furnishing of structural materials was greatly delayed by reason of the Edgemoor Company's not receiving some of the necessary drawings, from the Bridge Company, for the construction of the various shapes and combinations required *until two years after all the materials were to have been furnished* ready for use in the bridge according to the specification of the contract.

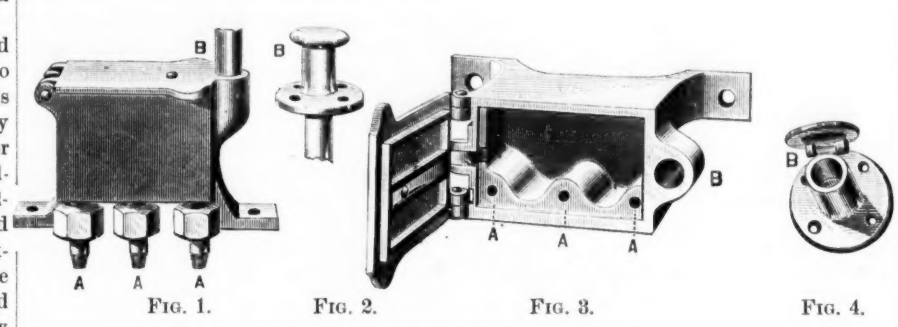


FIG. 1. FIG. 2. FIG. 3. FIG. 4.

AUTOMATIC OILER FOR LOCOMOTIVES.

Campbell's Automatic Oiler for Locomotive Engines.

In running locomotives without stopping between stations long distances apart, the necessity of a reliable automatic oiler for lubricating parts inaccessible when in motion, as the driving axle bearings and adjacent wearing surfaces, is strongly felt. A device for this purpose has been made and placed upon the market by the L. B. Flanders Machine Works of Philadelphia, which it is claimed is efficient and comparatively inexpensive.

The box or reservoir for holding oil and wick, shown in cuts, is fastened to the frame of the engine as near as possible to the stirrup. Three pieces of gas pipe (*A*, *A*, *A*, Fig. 1) are fastened to the bottom of the box by means of brass pipe-nuts, which are so bent as to reach respectively the box or journal-bearing and the tops of the shoe and wedge on each side of the box. On the inside of the oil box and corresponding to the projections to which the pipes mentioned are attached, are tubes (*A*, *A*, *A*, Fig. 3) cast with the box, and into these, wick is inserted for feeding a regular quantity of oil — the quantity being determined by the amount of twist given the wick. Easy access is had to the box by means of a spring lid (*B*, Fig. 1). At one end of the box is a projection into which is inserted the supply pipe that runs from the cab or foot-board.

A plain, strong oil cup (*B*, Figs. 2 and 4) for the cab or foot-board is furnished, that cannot easily be broken or dented. Into this cup oil is poured, when running, if necessary. Four or six boxes are used, depending on the number of drivers. Each cup will supply oil sufficient for a run of from four to six hundred miles, as there is no waste.

LETTERS FROM PRACTICAL MEN.

Chills.

Editor American Machinist:

Small chills can be used to great advantage in place of either green or dry sand cores. The holes will be much smoother and uniform than they can be made by using cores, provided the quality of iron used is good.

I once worked in a foundry where a good deal of chilled work was made, and often the chills would come out very hard; sometimes they would stick so tightly that they would have to be cut out.

The most trouble came from a chill 10″ long, ⅝″ at the small end and ¾″ at the large end, ½″ thickness of casting. I asked the foreman why these chills did not come out as well one day as another. His answer was, "I don't know; keep on making them and they will come all right in a few days." So they did, but I was not very well satisfied, so I took the earliest opportunity to solve the mystery, as it then seemed to be.

One said they were poured with too hot iron (which would made a difference), another said the casting was too thin, or they were left too long in the mould before pouring.

Upon examining the castings that had been cut open, and breaking a good casting, I found a great difference. The first was chilled almost the whole thickness, and the surface was broken and stringy; the other was chilled about $\frac{1}{16}''$, and was smooth as need be. I concluded the difference was in the iron, which has often proved itself since. The melter was careless in charging his different grades of iron. After this trouble was remedied scarcely any difficulty came from them.

I am now using about four hundred small chills every day, using the smaller ones (⅛″ to ⅜″) in diameter, and the largest ones, for solid boxes or bearings (10″ long by 1½″) diameter at small end, and 1⅝″ at large end.

The best coating for small taper chills is good machinery oil, rubbing on only a very small quantity. For longer chills, lard with enough black lead to color it. Long chills of small diameter should be warmed enough to handle easily, and coated with black lead mixed with water, about as thick as cream. The coating should be put on evenly and rubbed until it is smooth and free from lumps on the chill.

FOREMAN MOULDER.

Making Moulding Cutters.

Editor American Machinist:

I notice an inquiry in the AMERICAN MACHINIST of Jan. 6th, as to the best way to make a set of cutters to make mouldings, from drawings. It can be done as follows: Get out a piece by hand, from one to two or three inches long, according to the depth and width of the draft, and then take a piece of board the width of the cutters, and tack a piece on the side that will coincide with the gauge on the machine; then saw the sample

piece of moulding to an angle of 45°, and glue or tack it on the piece of board, at such a distance from the gauge piece as the edge of knives are from the gauge on the machine. See that the sides of the knives agree with each other as the cylinder is revolved, if not file or grind until they do. Take them off the cylinder and lay one of them on the board with the side of the knife against the edge, slide up to the moulding and cut out all prominent points until it is very nearly right. Paint the moulding with thick paint, press the knife up to it and the paint will mark all high places, which must be removed, and so on until the paint shall mark the whole length of the cut. Take the other knife and do the same, and they are ready to be tempered.

The reason for all this will be seen by making a sketch of the cylinder with the edge of the knife at the point of contact with the lumber, and taking a bevel and placing one arm on the lumber and the other against the knife. This shows just the angle that the knife is when it does its work.

Now I want to ask a question of some of your readers. It has often been observed that a nut gets loose and works off a bolt when on the top, and often will not work off when on the bottom side, although it may be so loose as to jingle back and forth. Why is this thusly? H. REYNOLDS.

Mechanical Modesty—The Moulder as a Professional Man—Good Advice.

Editor American Machinist:

A recent editorial in the AMERICAN MACHINIST under the title of "Mechanical Modesty," might be taken by a good many as having a personal application, and may undoubtedly influence their future action for the general good; but after all, is it not a fact that people look with incredulous eyes, and listen with incredulous ears, when a practical man expresses himself, especially if he happens to be nothing but a journeyman mechanic? Perhaps the recital of a little personal experience will serve to illustrate my meaning.

Not long since a gentleman came into the shop and asked what we would charge to make a casting which he described. He had no pattern, but from his description it was evident that it could be made without a pattern.

"Three and one-half cents a pound," he was told.

He objected to the price; he had similar castings made some time since for three cents. In the conversation that followed it transpired that the parties who made these castings, furnished a pattern, for which they charged him ten dollars. This pattern was used only once, and was now worthless. He was informed that if he would pay ten dollars for a pattern the casting would be furnished for three cents a pound, but at the same time that it would be a species of legal robbery to charge him for a pattern when one was not necessary, or advisable, in an economical point of view.

Finally he proposed that I go and see where the casting was to be used, and also see the pattern, and decide whether or not it could be altered to suit the present requirements. The job was his, not ours, so he was informed that the charges for time and advice would be five dollars. This was evidently a new phase of the case to him, and struck him accordingly. When he recovered his mental equilibrium he exclaimed: "That is the worst I ever heard of; a moulder charging for advice, for all the world like a professional."

"But my dear sir," queried I, "do you expect advice from your lawyer, or your doctor, or from a civil engineer, gratis?"

"Well, no; but then that is a different thing; you see I expect to pay them. For instance, I have just paid a lawyer's bill for advice; ten dollars."

"How much of his time did it occupy!" I asked.

"O, not much time; I dropped into his office a couple of times and asked him a half dozen questions; time didn't have anything to do with it. I paid him for what he knew."

"How long," I persisted, "has he been in acquiring his trade, I mean his profession?"

He didn't answer; he mused a little. "Mr. Foundryman," he says, "I guess you are right, but it struck me unexpectedly. When I come to think of it, you have been to school longer than he has, only there is a difference in the kind of school. If one man deserves pay for what he learns in a college, another is entitled to consideration for what he has learned in the hardest kind of a school, such as you have been attending for twenty years past."

He paid the five dollars for the time and advice, and then saved five dollars over his previous trade; but you see, Mr. Editor, if you see the point, that the practical man generally finds help in getting himself set down as a small cipher.

Probably this is largely due, as you suggest, to the fact that the mechanic does not assert himself as he might; but the AMERICAN MACHINIST, by affording him a channel through which to express his views on practical matters, and where, if his conclusions are based on false premises, some of its readers will be very likely to undeceive him, is doing a good deal to remedy this.

A mechanic said to me: "Some of those center reamers illustrated in the AMERICAN MACHINIST are worthless."

"Does it advise the use of that kind?" I asked.

"Why, no."

"Well, now, my friend," I remarked, "you know what a good center reamer is, and how to use one. Sit right down and sketch out your idea of the *ne plus ultra*; state your reasons, send to the editor, and you will get an audience of several thousand. You can do yourself credit and do others good. If you have got something that is ahead of present practice in this respect, let it out. It wont injure you; it will help you. It wont injure others; it will help them. If you have got something that you have been deceiving yourself with, some of the boys will satisfy you where you are wrong. In any event, everybody will be better for the exchange of opinions." FOUNDRYMAN.

American Foundry Practice.

Editor American Machinist:

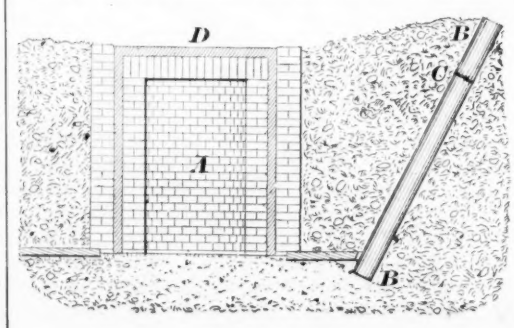
There is one important branch of the mechanic arts that has been persistently neglected by those competent to write upon it. I refer to the theory and art of "iron founding." There have been, it is true, works written upon the subject, but not apparently by men who knew by actual experience in the foundry, the principles of the trade. They describe in the shallowest possible way the process of making a grate bar, a pulley, or it may be a kettle, and sometimes the process of making a steam cylinder in loam is attempted; but these descriptions are for the most part written for the general public, and not in reality to help moulders. A perfect stranger to the business might enter a foundry, watch the different operations, inquiring about this and about that, and be able to write down his observations, and it may be publish them in book form. But would such a work have the smallest possible effect on the elevation of our trade? Would it assist a moulder to make better castings, improve his taste or lead him to a knowledge of the best way of making a cylinder or a fly-wheel? After many years' experience in the business, I do not know of a single moulder who at any time derived one single new idea from any existing book on iron founding.

With the advent of Thomas D. West's book on American Foundry Practice, all this seems in a fair way of being changed. Here we have a work written by a practical man, that grapples with the difficulties of our trade, his aim, as he says in his preface, being to show that the "moulder's trade is something higher than the mere muscular force necessary to pound sand." It required courage to do this, because there are so many different ways of accomplishing the same end, that it would be almost impossible to avoid adverse criticism in all cases.

The work is written in a quiet, off-hand, unpretentious style, and deals in language understood by moulders, and it is for doing this that moulders in particular, and indeed, everyone connected with an iron foundry, should thank Mr. West.

It is beyond my purpose to criticise the book in detail, but while admiring the excellence of the work, there are yet portions of it that can be found fault with, and are open to question. For instance: at the close of the section on green sand moulding, he gives "one hundred items apprentices should know and remember," and among them are some really valuable hints. However, I propose here to examine the correctness of Nos. 1 and 2. They are as follows: No. 1, "Moulding sand contains gases," and No. 2, "The gases in moulding sand pass out when iron is poured into a mould." Now, seeing that these two propositions are really concerned with the theoretical foundation of our trade, it is needful that they be strictly accurate. Let us ask the question: What gases are in moulding sand? Or rather, What is the chemical constitution of moulding sand?

Moulding sand is almost entirely composed of silica, which is a compound of silicon and oxygen. There is also a small percentage of lime and alumina, with a still smaller percentage of organic matter. Where, in all this, are the fretful gases with which the moulder has to contend? What gases are in the above constituents of moulding sand, that we see sometimes bursting a mould all to pieces, and sometimes see their effects on castings that are scabbed and blown into unseemly shape? We find no hydrogen here; nothing but oxygen, which, while it is the great supporter of combustion, is in itself incombustible; and yet in reality the gas, that is the terror of every moulder that does not understand his business, is a nearly pure hydrogen. It is this gas that "passes out when iron is poured into a mould."



But where does the hydrogen come from? It comes from the water that is in the sand. When the metal runs into a mould, it of course generates steam from the water that is in the sand, and as it is a property of iron, as it is of several other metals, to decompose steam at a white heat, or in a molten condition, it follows that as soon as the steam is generated and comes into contact with the flowing metal, it is decomposed into its original elements, hydrogen and oxygen. The hydrogen passes out through the sand, and taking up on its way a small portion of carbon, which is put in the sand as coal dust, it burns on the top and sides of the mould as a hydro-carbon. The oxygen which it leaves behind is taken up by the iron, and forms an oxide of iron or the scale of the casting.

It is a favorite experiment in elementary chemistry to pass steam through a gun-barrel heated to a white heat. The steam is decomposed in its passage, and the hydrogen burns at the other end, while the oxygen is taken up by the gun-barrel, which in a short time becomes useless. This simple experiment illustrates the chemical reaction that takes place in a mould while it is being filled with iron. I have endeavored to give my ideas on this part of the subject, as I think it of fundamental importance that moulders know these simple chemical facts. I am convinced that a greater general knowledge amongst moulders of these things would avert a great many of the disasters which doggedly follow the footsteps of the botch workman.

In this connection it may be well to treat of the nature and behavior of this hydro-carbon gas under special circumstance. Mr. West relates in his book how "an accident happened to a moulder, an acquaintance of his, that came near costing him his life, and setting fire to the shop, by the blowing up of the mould when being cast." The mould in this case was a kettle cast bottom upwards. It is always dangerous to cast a mould of this kind, that is hollow inside and with a confined air space, as the lighting of the vent pipes leading from the inside of the mould frequently causes an explosion sufficient to break the mould in pieces and throw the metal towards the roof of the foundry with terrific violence. The cause of such an explosion may be explained in this way: *A* is the hollow part of the mould from which the vent is led upwards by a pipe *B*. This hollow part, previous to casting, is of course filled with air, and at the moment that the metal passes into the mould, hydrogen passes through the spaces between the bricks, and rises upwards through the air until it can rise no further. It also passes upwards to the mouth of the pipe. At first, when the metal has risen but a short distance in the mould, it is so diluted with air that it cannot burn, but as soon as there are two volumes of hydrogen generated for every five volumes of air (that the mould already contains) an explosive mixture is formed, which being ignited at the orifice of the pipe travels downward and explodes the gaseous mixture inside, with the usual destructive results. If pure hydrogen were to ascend to the mouth of the pipe, instead of this mixture of air and hydrogen, it would burn quietly, and would not descend to ignite the inside gases.

Now there are three ways by which the moulder can overcome this difficulty: 1st, he can use what Mr. West describes as a cold vent; that is, a pipe leading the gas out through the wall of the foundry to the outside, so as to be away from sparks (or red-hot skimmers) that are always attendant upon a cast. This method is at best clumsy, and besides is not absolutely safe. 2d, The filling up of this hollow space with small cinders or loose sand. The object in this case is to prevent an accumulation of this explosive compound. A 3d way is to make what is called a safety vent, which is made as follows: Make a joint near the top of the vent pipe, and place between the two pieces of pipe a piece of wire gauze (as at *C*) that should not have less than 760 meshes to the square inch. This gauze will arrest the downward progress of the flame, and prevent an explosion. This plan is on the same principle as the Davy safety lamp. Iron founding is like most other things, in this: that when the cause of a disaster is known, the avoidance of it is easy.

Moulders have themselves to blame if they allow their trade to become degraded below that of the carpenter's and machinist's. There is certainly no lack of something to think about in the business. As the elder Mushet once said: "I know of no more interesting spot than within the walls of a well-regulated iron foundry."

I therefore advise the moulders of America to read Mr. West's well-written book, as I think it will help to elevate the trade, and curtail the already too numerous body of poor workmen. P. L. SIMPSON.

Foreman North Star Iron Works Foundry, Minneapolis, Minn.

How to Distinguish Steel from Iron.

Editor American Machinist:

Can any of your readers give me an infallible rule for determining whether any certain piece of metal is steel or iron? To prevent any discussion of the ancient query, "What is steel?" I will define it to be any product of the crucible, open-hearth or Bessemer process, and iron to be a product of a welding process.

I have a piece of polished sheet metal, .040 inch thick, imported from England under the name of iron. It is said to have been polished in rolling, then pickled (in a bath of dilute sulphuric acid) to remove scale, then cold rolled, and finally annealed in an air-tight box. A tensile machine test gave 42,333 lbs. tensile strength, 28,333 lbs. elastic

limit, 11.2 per cent. elongation in 5 inches, and 32.2 per cent. contraction of area. It was folded twice and hammered down flat, and the corner of the four-ply fold drawn out cold under the hammer to one-half of its original thickness before showing a crack.

A strip of the original sheet half an inch wide could easily be bent backwards and forwards by the fingers. The same sized strip heated red hot and plunged in water was hardened so that it could no longer be bent to more than a right angle by the fingers, and on attempting to hammer it around and flatten it, it broke when the bend had about half an inch diameter.

This hardening test is by no means conclusive that the piece is steel—for I have seen steel which was much softer and iron which was much harder under similar tests. The double folding test I have often seen as perfect in both iron and steel. The tensile machine test indicates iron chiefly by its low percentage of elongation. I have seen steel as low in tensile strength, but it had more than double this elongation. The appearance of the piece, perfectly free from flaws, indicates steel. Its ring is that of iron. Half a dozen judges have failed to give it a name. One suggests that it be tested by a chemist for manganese, that if it contains any appreciable quantity it is steel, if not, iron. But I have seen Swedish steel reported to contain only .012 of one per cent. of manganese. How then shall the question be determined?

K.

Good Features in Engine Lathes.

Editor American Machinist:

As the discussion of the good and bad points in the construction of engine lathes seems to be in order, I will venture a remark on the subject. It seems to me that the set-over slide in the tail-stock of the ordinary engine lathe is entirely too narrow. The slide in an 18″ lathe being barely 6″ in width, the holding-down bolts not more than 3¼″ from the rear end, then, when the spindle is run out so the point of center projects 6″ or 7″ from face of tail-stock, the leverage which the thrust of the cut has to lift the center is nearly as four to one, which is not at all an exceptional case. Although makers have of late increased the length of the tail-stock upon the bed, they appear to have entirely overlooked this quite important point. Why not make the width of this slide as great as the bearing on the ways?

The (3) three-points system of support has also been talked of, and ably described by Professor Sweet; but no one has yet given him credit for a foot lathe which was designed by him, and built by him for Mr. Henry T. Brown, of New York, then one of the publishers of the old *American Artizan*, and illustrated and described in that paper in the latter part of 1874, if a remember correctly.

It was built with legs of the usual front and back plan, the one at the tail end being pivoted to the bed. It also had other points of excellence, which the makers of small lathes that I have seen would do well to study.

One very nice point was, a means to draw back the tool instantly when cutting screws, and to replace it in the same position again at will, and with positive accuracy, the cross screw being free to give the desired depth of cut. CHAS. S. BEACH.

Mechanicsville, N. Y.

Graduations on Planer Heads.

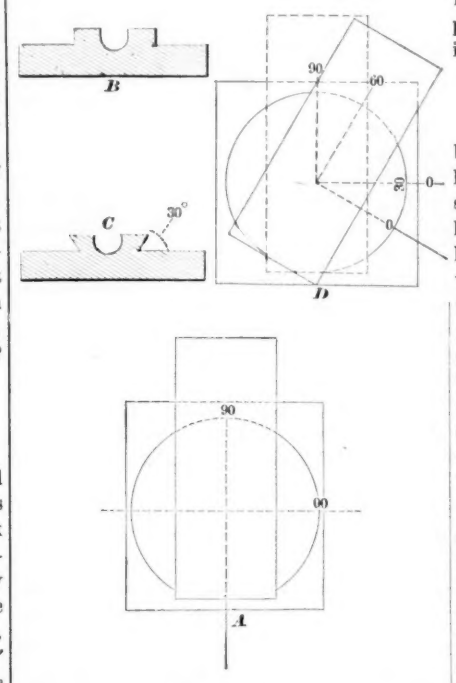
Editor American Machinist:

J. M. Webster, in your issue of Jan. 6, criticises George H. Smith's sketches *B* and *C* (Dec. 16), but he does not hit the mark. The question is, what would a planer hand do with those two pieces of iron, if he had orders to plane a 40° bevel on both, and no protractors thrown in?

He would first hunt up the "boss," who perchance would know as much as he did, and after spending a half hour's time, they would come to the conclusion that one was to be planed at 40° and the other at 50°.

"A little study" convinces them that they are not floored. Most manufacturers object to reading or studying in working hours; then why not fix your drawings so that a fair workman can take his metal and drawing and go about his business without bothering the "boss." A draughtsman should know about what parts of a machine are to be planed (and it wouldn't do any harm if he knew how to plane them).

I still claim that planer heads are figured correctly. Mr. Smith says (supposed soliloquy of planer builder), "We work from the platen, * * we will mark it 90° when perpendicular," and adds, "that would be my argument, though all makers, as far as I know, mark 0 at the perpendicular." If this were the fact, the cases would be rare, in which a workman would get bothered in setting over the head. I never saw a planer marked 90° on the side of the swivel. The fact is, they all mark 0 on the side (see



sketch *A*), and that 0 is on a horizontal line through the center of the swivel, and parallel with the platen. The graduations are then numbered each way, as far as the circular part of the swivel will allow.

Mr. Smith also says: "Neither a drawing nor a bevel protractor could influence a planer hand in setting the head over."

Who or what could influence him? Must the "boss" be called every time there is a bevel to be planed?

If Mr. Smith should bring me a piece of iron like sketch *B* (end view), and say, Plane that, what would I do? Of course, I'd plane it, as he told me; but allowing that he brought me a drawing like sketch *C*, showing a bevel marked 30°, I would at once be strongly "influenced" to set my planer head over to 30°, and make piece *B* as near like the drawing as possible.

To do this I would only have to lower the end next to me of the imaginary horizontal line, through the swivel end 0, till the figures showed me that I had tipped the head 30° (see sketch *D*) from its perpendicular position. If his drawing was marked 60°, I should be "influenced" to subtract 60 from 90, and obtaining 30, would set it at 30°.

Now in regard to the base or working line. I know but very little about making drawings; but, from what I have seen and read and heard, I had got it into my head in about the same shape that Mr. Webster has; the base line is a horizontal line; we work from the level on which we stand, viz, the earth.

It has seemed to me, when I have had business in the "drawing room," and seen men at work making work for us, that they were working from a "base line," and that that base line was parallel with the lower edge of the drawing board, which is a supposed horizontal line. I had supposed that the straight edge of the head of a T square was the working line, but I may be wrong.

Suppose I am right. A draughtsman has to draw a piece like Mr. Smith's sketch *B*. He sets over the *blade* of his T square till the pointer indicates 50°, and then marks the drawing 50° because his T square said so.

"I was amused," again, to see that Mr. Smith agreed with me so far as to think the heads of T squares should be figured, as proposed, for bevel protractors.

If they were figured, as he calls it, on the "new idea," the drawings would be figured so that a man of fair understanding need have no trouble about hunting up the "boss" to "influence" him in setting over the planer head. M. C. K.

Providence, R. I.

Petroleum as Fuel.

Editor American Machinist:

Mr. W. Barnet Le Van's article on "Locomotives of 1882," in your issue of Jan. 13, 1883, is sadly in need of revision, especially that portion relating to liquid fuel.

First—His arithmetic is bad. If coal, as he says, produces 10,000 units of heat and hydrogen 60,000 units, there is a gain of 500 per cent. instead of 83.33 per cent., as he has it, or

$$\frac{(60{,}000 - 10{,}000)\times 100}{10{,}000} = 500 \text{ per cent.}$$

Second—Good merchantable coal, properly burned, should produce 13,000 units of heat instead of 10,000, as Mr. Le Van says. Twenty per cent. of this may, however, escape up the chimney, leaving but little more than 10,000 units absorbed by the water in the boiler, but probably the same percentage of heat produced by hydrogen gas would escape. It is scarcely fair to assume that 60,000 units of the 62,000 produced by the complete combustion of hydrogen is utilized in a boiler, when only 10,000 or 11,000 units are utilized, out of the 13,000 or 14,000 units produced by the complete combustion of good coal.

Third—Any comparison of the merits of solid and liquid fuel which does not take into account the relative cost of the two fuels is useless. If Mr. Le Van will take the price of crude petroleum at Philadelphia and calculate from its analysis, say 85 carbon, 15 hydrogen, how many heat units can be obtained from a dollar's worth of it, and then calculate how many heat units can be obtained from a dollar's worth of either anthracite or bituminous coal, I think he will find the advantage still in favor of solid fuel, notwithstanding the low price of petroleum.

Fourth—As Mr. Le Van says, "Facts outweigh the profoundest and most ingenious speculation." The facts are that numerous experiments made during the last twenty years have failed to prove that there is any economy (of dollars and cents) in the use of petroleum as a fuel under steam boilers. The Standard Oil Company, who have the crude petroleum at the lowest cost, still use coal under their boilers. COAL.

Mud Drums on Boilers.

Editor American Machinist:

In your answers to correspondents, issue of January 6th, giving your objections to mud drums on boilers, you say: "We believe, on general principles, that when boilers are properly constructed there is no occasion for mud drums; and, furthermore, that they are generally neglected and always subject to corrosion, and liable at almost any time to cause a serious accident." This expression of your opinion creates with me a desire to hear more from you on the subject. I should like to know how locomotive boilers should be constructed to render a mud drum of no service. I find them of great service in keeping mud out of legs of boilers as they are now constructed. Why are the mud drums more subject to corrosion than the lower portion of fire boxes? That they are neglected indicates only a fault in those having charge of them, and no fault of the mud drum. J D. H.

[Our objections to the use of a mud drum, as applied to locomotive boilers, is that the necessary hole weakens the shell of the boiler in an especially bad place, that is on the bottom; that the attachment of the mud drum leaves places where corrosion is likely to occur, which may not be noticed until after serious results, and that the mud drum itself is a protuberance likely to be knocked off in the event of an accident to the locomotive. We believe that enough of the lower tubes should be left out to permit of the insertion of a large hand hole, and also to leave room for sediment to deposit in the bottom of the shell without coming in contact with the tubes. Through this hand hold the dirt can be loosened up and washed out. Of course this will not do away with the necessity for cleaning out the legs, neither will the use of a mud drum. We assume that corrosion is more likely to do damage around the mud drum than in the leg around the fire-box, because the mud drum is purposely placed as much out of the way of circulation and agitation as possible, and hence there is but little to disturb corrosion after it commences. It is true, as our correspondent states, that neglect indicates no fault in the mud drum, but it is also just as true that many otherwise good things, but which would be dangerous if neglected, are not used simply because experience has demonstrated that it is not wise to depend too much on their being properly looked after. Aside, however, from any question of neglect, we believe that mud drums on locomotive boilers are not necessary, and that it is not advisable to place them there. While expressing our own opinions, we respect those of our correspondent, who, we believe, has had experience in their use.]

Points About Engine Lathes.

Editor American Machinist:

Now that your correspondents have thoroughly discussed the defects of the average lathe, particularly the skeleton, or "fiddle," fast headstock, small spindle and powerless spindle gearing and small cone, a few lines on the tailstock might not be out of place. The old plan was to have the spindle, screw and guide-pin, go through separate holes in the headstock, and all connected. Of the modern tailstock the heaviest are not always the most rigid. In my opinion the best form is the round-topped one, with a boss 3 or 4 inches long at the center, and a slotted and threaded cone for tightening, and short holding-down bolts. This makes a stiff headstock with the weight in the right place, and lighter than some of the other types. The plan of having the spindle go entirely through the hole, and the hand-wheel travel with it, gives a fine, long bearing, and always the same, no matter how far the center end projects.

When headstocks exceed 15 inches high at the centers, it is a good plan to furnish them with rack and pinion, for ease in handling. Opinions differ, but I dislike the plan of having a square box and the set-over part mounted high, with a long bolt up the center of the inside and a square top with two round balls in the center of the headstock for binding, and a ball and handle on the back end of the spindle.

For heavy work, the plan of having a stopper to prevent the head from slipping, is a good one.

Your correspondent, Mr. Yates, objects to mounting headstocks on small inverted V's. One advantage of this plan is, if the shears are too light or insufficiently braced with cross ribs, the head being on V's, keeps the ways solid and the centers in line.

When the English shapers were first introduced in this country the New England manufacturers did not adopt their favorite plan of making small V's on the ways, instead of the broad flat surfaces gibbed under.

On flat ways the lathe carriages not only move easier, but are, in my opinion, 50 per cent. more durable than shears of the small V's, wearing slack where most used between the centers, and having to be replaned every 7 or 8 years. The V plan is seldom adopted on compound slide rests, cross slides on the carriage or milling machine, etc. It is just as necessary to gib a lathe carriage under at the back as at the front.

Many of your correspondents object to the complicated inaccessible apron gearing. If simplicity and less weight on the front is desired, why not let the screw of the cross slide go entirely across, and have a worm wheel on the back? That would equalize matters and prevent undue weight on the front.

In a shop where quantity as well as quality is desired, the simpler machine tools are constructed the better. J. K. C.

Fort Wayne, Ind.

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NEW YORK, FEB. 3, 1883.

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Furnishing Mechanical Advice Without Reward.

Our correspondent, "Foundryman," in another column, forcibly calls attention to what has come to be a confirmed habit, viz., consulting experienced, practical men—non-professional men, so-called—on matters pertaining to their specialties, without the expectation or intention of paying them, even for the time occupied. Such men, for the most obvious of reasons, are very desirable men to consult, but it is altogether unreasonable to expect them to furnish advice for nothing, or even at ordinary time rates, simply because they do not advertise themselves as "experts," or something of the sort. This is particularly so, since those who consult them with the expectation of getting something without paying for it, would expect to pay a man ten times the amount of a mechanic's wages for the same attention, in time, if he furnished evidence that he had been to some different school from theirs for three or four years. The amount of information on mechanical matters—technical information—furnished gratis by foremen and workmen in jobbing shops, foundries, machine shops and pattern shops particularly—is beyond the comprehension of those without experience in such matters. It is not generally that the customers of such shops simply want a job done; they want to know how and why they want it done, the consideration of the subject, including, probably, a pilgrimage to its proposed destination, to judge of its general adaptation, with the probability that the work will, in the end, be given to the party that will do it for the least money, which will generally be some one who has no time to account for before commencing it. In any event, the patrons of a jobbing shop of either of the classes mentioned would be shocked into bestowing their future patronage elsewhere, if they were charged with the time actually spent in investigating, inventing, and making the necessary drawings or sketches. Custom is a great maker of law, and custom goes a good ways in decreeing that when a man works with the tools of some trade, notwithstanding their use has directly and indirectly been the means of educating him to *know* as well as to *do*, he shall be paid for what he does—not for what he knows. Custom, in this respect, needs reforming, and reformation is working surely if slowly. The value of a little actual knowledge, without reference to its source, as compared with any amount of fine-spun hypothesis without other sensible foundation than that of a vivid imagination, is becoming every day better appreciated, and such knowledge may be safely trusted to hold its own in the future.

Freaks of Absent-Minded Mechanics.

The absent-minded mechanic seldom, if ever, appears in print, notwithstanding there is a great many of him.

We often read accounts of the peculiarities of absent-minded individuals in other pursuits and professions, but somehow in reference to the mechanic nearly every one seems to have kept silent. When we first entered a machine shop as an apprentice, the first specimen of absent-mindedness that we remember was that of a workman who took down the pump valves on a locomotive to grind them in. This individual had frequently performed the same task previous to that without any trouble, but somehow he put in the upper valve of the pump upside down. The locomotive went out, and while running at a high rate of speed the water was turned on, when a loud report announced the fact to the engineer that he was minus one pump, it having been split from end to end by the enormous pressure generated within it.

Another workman in quartering a pair of driving wheels before pressing them upon the axle, had them placed left-handed, so that the left side of the engine would lead. In other words, when a person stands at the end of the axle facing the wheels, the nearest wheel should have the crank pin at the right of the axle, while the farthest crank should be directly over the axle, and the two precisely at right angles to each other, so that the right side would lead. Instead of placing them in this way the workman had placed the nearest wheel so that the crank stood at the left side of the axle, while the other crank stood directly over the axle. This he stoutly maintained was all right, as the wheels could be turned around before putting them under the engine, which would bring them all right. It took considerable time and an exhaustless array of arguments to convince this individual that he was wrong, when the truth flashed upon him all at once, and he proceeded directly to heap all sorts of abuse upon himself, also expressing a desire to submit to the process of booting if we were willing to do our part. He knew how to do the work, as he was an old hand at the job, but he didn't think. We once knew an old hand who had worked for years upon round house repairs, who was one day told to put the side rods upon an engine in the round house. He pinched the driving wheels so that the main pin stood above the axle while the back pin was below, and proceeded to connect up the rod with the pins in that condition. He had nearly completed the work when his attention was called to the position of the cranks by the foreman. Upon comprehending his mistake this workman admitted that he did not think.

On one occasion we took a locomotive out of the shop and were somewhat surprised to find that while the exhaust came out clearly from the right hand cylinder, the left could not be detected except by one continual blow of the escaping steam. An examination of the exhaust nozzles revealed the snout of a squirt can protruding from the aperture. The can filled the pipe so completely that only a small portion of the exhaust steam could escape. A subsequent examination revealed the fact that the workman in putting up the pipes had very carefully concealed his squirt can within the exhaust pipe to prevent its being stolen, and had connected up the pipes without removing his oiler. The can was, however, sacrificed to save breaking the joints of the pipe again. We were once acquainted with a lathe hand who seemed to constantly labor under the impression that a considerable quantity of stock was to be taken off his work. Upon placing a piece of round iron, such as a large bolt, a piston rod, or pump plunger in his lathe, he would habitually start a rough cut and run some distance before measuring his work to see how much stock was to come off, when a measurement with the calipers often convinced him that he had botched the job. When fitting a piece of work to a taper hole he neglected to try his work in the hole as often as he should have done, when suddenly he would realize that he was unable to put on sufficient stock to make a proper fit, too much having been taken off through his allowing some foreign subject to occupy his mind when it should have been occupied by his work.

We have repeatedly seen planer hands in planing off brass surfaces use a tool with sufficient rake to the edge to freely cut wrought iron. Such a tool would work well for a short distance until the edge becomes somewhat dulled, when it would suddenly dig into the surface of the work and either stop the planer or rip things up generally. The workman would then accuse himself for his stupidity for attempting to use such a tool when he well knew what the result would be. He appeared to labor under the impression that possibly through the aid of some supernatural agency the surface could possibly be planed without serious trouble.

A workman answering to this description used to keep his tools within the bed of the planer upon a board placed upon the flange at the bottom. One day he put his hand in there to get a tool, and something attracting his attention, he did not withdraw his hand quickly enough. The consequence was that his hand was fearfully jammed, being nearly torn off at the wrist. Thousands of fingers are lost annually, limbs broken, arms torn off, eyes put out and lives sacrificed through the absent-mindedness of individuals in responsible positions.

The majority of the accidents that occur can be traced directly to this inexcusable fault. It is a common practice among lathe hands to center and carefully face up the ends of axles and shafting, then proceed to straighten them. After the work is turned and finished, they complain that the ends are not at right angles to the parallel sides, when they well knew that the work should have been straightened first and the ends squared up afterwards. An engineer once removed the steam gauge from his engine to have it repaired, and in the morning, after the gauge had been replaced, he fired up. When the usual time had elapsed for raising steam, he noticed that the gauge indicated no increase of pressure within the boiler. The engineer, becoming impatient, fired up with tremendous vigor and went into the engine room for a few moments to oil up, when suddenly he was astounded to hear the roar of steam escaping from the safety valve, which had been suddenly raised by the rapidly increasing pressure. The engineer rushed to the fire-room and was powerless to speak for a moment after inspecting the gauge, finding that it still remained as at first. A moment's reflection convinced him that he had neglected to open the cock in the pipe connecting the gauge with the boiler.

The fact that the safety valve was in fair working condition was all that prevented an explosion, which would certainly have been attended with a tremendous loss of life. In putting on an eight-inch belt, a machinist took his station upon the wrong side of the shaft where the belt ran on the pulley. He took up the belt and pressed it upon the pulley, when suddenly his arm was caught and torn off between the shoulder and the elbow. He is still alive, and has a lifetime in which to lament his absent-mindedness. This question often arises in his mind, "why did I place myself upon the wrong side of the pulley when I well knew what would be the consequence?" It is and will probably always be to him a mystery how he came to commit such a reckless act. The foregoing incidents are all true, and a great many other similar ones might be added, but we trust that those herein recorded are sufficient to illustrate the frequency of the casualties brought about by absent-mindedness.

Literary Notes.

Report of Proceedings of the Fifteenth Annual Convention of the American Railway Master Mechanics' Association, 1882. Published at Cincinnati, O., under direction of the Secretary of the Society, J. H. Setchel. Price $1.75.

This report is one of the most valuable ever published by the Master Mechanics' Association. The report of the committee on improvements on boiler construction is illustrated, and contains much valuable as well as practical information.

A free discussion upon the merits and demerits of the Joy valve gear forms an interesting part of the book. This discussion is rendered more interesting by appropriate engravings. The Webb compound locomotive has been therein illustrated and described.

A paper on safety attachments for locomotives is well worth reading, likewise the report of committee on side rods, both of which are illustrated.

The report of committee on new plans of construction and improvement in locomotive engines, contains a retrospect of the progress made during the previous year in locomotive construction, as well as giving suggestions for future improvement. All these reports as well as the practical discussions of interesting subjects connected with the motive power of railroads are of a very interesting character.

We have just received the official printed transactions of the American Society of Mechanical Engineers for the spring meeting of 1882, held last April. Each of the papers read is marked "Subject to revision." It would seem that sufficient time had elapsed since last April to revise all the papers and discussions. The paper presented by Samuel Webber on "Efficiency of

Turbines as Affected by form of Gate," was accompanied by three engraved diagrams as published in the AMERICAN MACHINIST of June 24, 1882. We notice in the official publication of the paper before us the diagrams have all been omitted, although they are referred to several times, and, in fact, constitute the chief portion of the paper.

The list of members and guests at the Philadelphia meeting, as reported in transactions, numbers thirty names less than were published in the AMERICAN MACHINIST of May 6, 1882, although our list was by no means complete, owing to that issue going to press before the meeting closed, and hence containing only such names as were received by telegraph up to the hour of closing the forms.

The Hour, a readable weekly journal, devoted, as it phrases it, "to social interests," begins Vol. X with a new winter overcoat, and its usual variety of interesting reading matter. The dashing female figure, displayed at full length on the first page, would, however, seem to indicate that *The Houri* would be a more suitable name for the publication. The paper is published at 40 and 42 Broadway, New York.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(36) J. W., Morgan City, La., asks: Where is the pressure greatest in a steam boiler: at the top or bottom? *A.*—See answer to question 204, June 17, 1882.

(37) H. S., West Somerville, Mass., asks: Is cast iron as strong, or stronger, for being galvanized? *A.*—We do not think there is any very material difference.

(38) W. H., Montpelier, Vt., asks: Which are the best for steam pipes, malleable or cast iron fittings? *A.*—Leaving out the question of cost, we should say malleable.

(39) C. F. B., Lexington, Ill., asks: In testing a boiler what difference should there be in the pressure applied between using hot or cold water? *A.*—No difference.

(40) B. W. R., East Boston, Mass., writes: I am aware that the piston of a steam engine stops at the end of the stroke. Does the crank also stop? *A.*—No. The motion of the crank is one of revolution, and it does not stop.

(41) S. H. M., Savannah, Ga., asks: Is there any book or paper published that treats exclusively of blacksmithing? *A.*—We do not know of either. The *Blacksmith and Wheelwright*, New York City, is a paper of good reputation, published in the interests of the two trades indicated by its title.

(42) H. G. D., New Berne, N. C., asks: Can you give me a rule to find the length of a belt to connect two shafts with pulleys of unequal diameter? *A.*—We do not see that any simple rule can apply to this.

(43) N. D. B., Buffalo, N. Y., asks: What power is it safe to put on 1⅛" and 1¾" common shafting? *A.*—You neglect to give the speed at which the shafts are to run. You can calculate that an 1⅛" shaft at 100 revolutions will transmit 10 horse power, and a 1¾" shaft, 16 horse power; then at any other speed the power will be proportional to the speed.

(44) O. B., Boston, Mass., writes: I am an apprentice and need a dictionary. Would you advise me to get Webster's or Worcester's? *A.*—Both are good. Worcester's is used in the Government offices, but Webster's is more generally used. Either will answer your purpose, and it is a good plan to have both.

(45) W. W., Camden, Pa., asks: 1. How can I get into the Lehigh University, at Bethlehem, Pa., and what are the terms? *A.*—Address a letter to the University named, enclosing a stamp for return, and you will doubtless get all the information you desire. 2. How large a boiler will I require for an engine 2"×4" at full power? *A.*—Boiler of ¼" iron 16" diameter and 40" high.

(46) Manufacturer, Toronto, Canada, writes: There is in use, I believe, by manufacturers of Bessemer steel wire, a table or scale defining the different degrees of hardness. Are such scales arbitrary; or is there a standard? *A.*—We are unacquainted with the matter. If any of our readers have information on the subject we shall be glad to hear from them.

(47) J. J. N., Gunnison City, Colorado, asks: In pumping into a tank which will be the easiest; to have the pipe run up the center of the tank to the top, and then allow the water to fall back, or to have the pipe just enter at the bottom of the tank? *A.*—Since if you run the pipe to the top of the tank you must pump the water, or the most of it, higher than if the pipe just enters at the bottom, there would be a difference in favor of the latter plan.

(48) F. C. D., Granby, Mo., asks: 1. Is it practicable to run an engine without oil or other lubricant in the cylinder? *A.*—Engines are sometimes so run, and it is the opinion of some engineers that there is no need of lubricating a cylinder if it is never begun. With extreme high pressures, where the heat would destroy a lubricant, the piston rings and valves are made of a material calculated to run without lubrication. At moderately low pressures we have known engines to be run for years without lubricating the cylinders, but with pressures ordinarily carried at the present, it is generally considered that lubrication is necessary.

(49) W. L., Brooklyn, N. Y., asks: 1. How are the eyes of needles made? *A.*—In some instances they are drilled; in others they are stamped. 2. How can I harden wrought iron? *A.*—You can case-harden wrought iron, one of the processes for doing which you can find in the AMERICAN MACHINIST of Dec. 23, 1882. 3. It sometimes happens that in heating a piece of steel, I forget that it is in the fire until it is burned. How can I restore it again? *A.*—We cannot recommend anything for restoring burnt steel. There are compounds sold for which this merit is claimed, which you can probably find by inquiring of general dealers.

(50) H. W. S., Gouverneur, N. Y., sends a sketch representing a pipe connected with the crank pin of an engine, ending in a ball against the center of the shaft, and asks: What is its use? *A.*—If H. W. S. observes, he will see an oil hole in the ball, which is continued through the pipe and to the center of the crank pin and through to the outside. A further consideration will show that oil put in the ball will find its way, by centrifugal force, to the outside of the pin for lubrication. It is an ingenious arrangement, the credit for which we are inclined to believe is due to the Buckeye Engine Company, of Salem, Ohio.

(51) W. A. H., Graniteville, Mass., writes: It requires but 15 horse-power to run our shop. We have a 50 horse-power engine and a 40 horse power boiler. What I want to ask is: 1. Can I save coal by reducing the grate surface? *A.*—If you are burning less than 7 or 8 lbs. of coal per square foot of grate surface, per hour, you can probably save coal by reducing the grate surface. 2. How often should the cylinder head of an engine be removed for the purpose of examining the cylinder? *A.*—With packing that requires occasional setting out, as often as you find it necessary to set out the packing; otherwise, if you observe nothing wrong, once in six months will generally be sufficient. 3. I use soap-stone packing. What kind would you recommend? *A.*—If you find the kind of packing used satisfactory, continue its use; if not, try any of the various kinds in the market, until you find something that suits.

(52) T. S., Charleston, S. C., writes: I am running an engine at 75 revolutions, the cylinder of which is 12⅜" bore, and the stroke is 24". The fly-wheel is 9 feet diameter, 15" face and ¾" thick. I want to get more power; and ask: 1. Could I increase the speed to 90 revolutions? *A.*—If the engine is properly designed and constructed there will be no trouble from increasing the speed to 90 revolutions, or considerably beyond. 2. Is the fly-wheel heavy enough for 90 revolutions? *A.*—The efficiency of the fly-wheel varies as the square of the revolutions; hence your fly-wheel will be better suited as the speed is increased. It should, however, be about 2½ times as heavy as it is, for good regulation and running. 3. What is the power of the engine at 75 revolutions, steam pressure 50 to 55 lbs., and what will be the power at 90 revolutions, steam pressure 70 to 75 lbs.? *A.*—Power at 75 revolutions, 50 to 55 lbs. steam, about 30 horse-power; at 90 revolutions, 70 to 75 lbs. steam, about 45 horse-power.

(53) Ignoramus, New York, asks: 1. How can I calculate the quantity of water a tubular boiler will hold? *A.*—By first calculating the enclosed area in cubic inches, from which deduct the space in cubic inches occupied by the tubes. This will give the contents in cubic inches, and by dividing by 231 the contents in gallons. 2. How is it that I can pump cold water into an upright tubular boiler where the tubes are not entirely covered with water, without causing an explosion? *A.*—So much of the heat is absorbed by the water around the lower part of the tubes that the upper parts of the tubes do not get hot enough to be immediately dangerous. 3. Is there any difference in the travel of an engine piston in the first and second quarter of the crank revolution? *A.*—If you mean difference in speed, yes. 4. In speaking of the speed of an engine are the number of revolutions, or the piston speed understood? *A.*—In speaking of speed the revolutions are understood; The number of feet the piston travels per minute is spoken of as piston speed. 4. At what velocity does water flow into a vacuum? *A.*—Theoretically, about 46 feet per second.

(54) J. R., Detroit, Mich., asks: 1. If I have a boiler with 50 lbs. air pressure in it, and let steam at 100 lbs. pressure into it, what will become of the air? *A.*—It will remain in the boiler, mixed with the steam. 2. Will a steam pump, with both water and steam cylinders 6" diameter, take steam from a boiler and pump water into the same boiler? *A.*—No. 3. What is the best way of placing self-adjusting packing rings in a piston. I have seen men much troubled to get them in? *A.*—We cannot tell without knowing more about the piston and packing. 4. Why is the distance the water is lifted added to the distance it is forced, in calculating the power of a pump? *A.*—It requires a certain amount of work to take water from one level and place it upon a higher one, no matter whether it is "lifted" or "forced." 5. How long will it take a young man to learn to run a locomotive? *A.*—We refer you to an article on this subject in the AMERICAN MACHINIST of Jan. 27.

(55) W. M., Springfield, Mo., writes: We have an engine, the cylinder of which is 10½"x20", engine running 165 revolutions, 80 lbs. steam pressure, cut-off at ⅞" stroke. A stream of water runs by the shop, and I would like to ask: 1. If in place of exhausting into the air, I lay some 3" pipe in the stream and exhaust through it, returning to the engine room and connecting an air pump, will I not gain considerable power and save some fuel? *A.*—If you succeed in getting a good job you will increase your power, or save fuel. 2. Can I run the air pump by means of a belt from the shaft? *A.*—Yes. 3. How much pipe and what size shall I use? *A.*—You can use 150 feet of 3" pipe. 4. How large an air pump shall I use? *A.*—About 7"x7". 5. What is the horse power of the engine with and without the attachment? *A.*—If the engine is well proportioned for the speed, 40 to 50 horse power without the attachment; with the attachment the saving should be about 15 per cent. of fuel, or 25 per cent. increase of power. Unless the water is very near the engine, you will probably have difficulty in getting the arrangement to work satisfactorily.

(56) R. S. K., Germantown, Pa., writes: I have a compound engine of the tandem type. The high pressure cylinder is 30" diameter, the low pressure cylinder 46" diameter, and the stroke 45". Initial pressure by gauge, 60 lbs., cut-off in high pressure cylinder at 4-5 from beginning of stroke. The low pressure cylinder exhausts through an injector condenser, which gives a vacuum of 13 lbs. I wast to ask: 1. Can you give me a rule by which to determine the power of the engine, making no allowance for loss from any cause? *A.*—The best way to determine the power of the engine is by the indicator. You can, however, make a purely theoretical calculation, as you suggest, of the power that would be developed if there were no losses from any cause, for which purpose you need not consider the high pressure cylinder at all; under the conditions named the power developed will be the same as would be developed in the low pressure cylinder alone, working with the same grade of expansion that you use in both cylinders. In making the necessary calculations, you must work from a vacuum, which you can for your purpose consider as 15 lbs. below the atmosphere, from which all pressures hereafter given are to be measured. The ratio of the cylinders is as 1 is to 2.35; the initial pressure is 60+15=75 lbs., cut-off at 4-5 stroke in small cylinder. Let 1 represent the capacity of the high presure cylinder, and 2.35 the capacity of the low pressure cylinder. At the end of the stroke, the high pressure cylinder 4-5 full of steam at 75 lbs. pressure, will have been expanded into the low pressure cylinder, and the terminal pressure in that cylinder will be 2.35 : 4-5 : : 75 : 25.5 lbs. This corresponds to an expansion of 75÷25.5=2.94 times. The hyperbolic logarithm of 2.94 is 1.08, very nearly, and the mean effective pressure for a single cylinder is (1.08+1)×25.5=53 lbs. Subtract from this the two pounds you lose in the condenser, and the mean effective pressure will be 51 lbs. Now reckon your low pressure cylinder as working alone at the speed you run it at, with this pressure. In practice your engine will develop considerably less power than this, in amount depending on the general construction, quality of steam, etc. 2. Suppose the pistons to be at the top, just ready to exhaust. As the pistons move the space in high pressure cylinder, occupied by the steam, gradually grows less, and the space in the low pressure cylinder is correspondingly increased. Under the previous conditions, how can I calculate the pressure between the high and low pressure pistons? *A.*—The terminal pressure in the high pressure cylinder, steam cut-off at 4-5 of the stroke, will be 75×4-5=60 lbs., which will be the back pressure in the high pressure cylinder, and the forward pressure in the low pressure cylinder at the beginning of the stroke, and as has been seen the pressure at the termination of the stroke is 25.5 lbs. This gives two points in a curve that will represent the pressure line you want to find. You can find as many other points as you want by calculating that the pressure at any point representing a portion of the stroke will be inversely as the space occupied by the steam. Thus at the beginning the steam at 60 lbs., absolute, occupies the small cylinder represented by 1, and at half stroke it occupies ½ of this cylinder and ½ of the large cylinder, which is represented by 2.35, hence, the space occupied is (1×½)+(2.35×½)=1.675, and the pressure at half stroke will be 1.675 : 1 : : 60 : 35.8 lbs. In this way you can draw a curve that would represent the pressure between the cylinders if the conditions were perfect. 3 Should not the pistons of the two cylinders be so proportioned that the mean pressure will be the same on each? *A.*—No. It is customary to proportion the cylinders and cut-off so that about equal work will be done in each cylinder.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J

C. M. Morse, Mech. Engineer, 95 Liberty St., N.Y.

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Mechanical Engineer. Complete motive power outfits a specialty. Peter Banta, Cold Spring, N. Y.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

J. C. Hoadley, Engineer and Expert, 28 State St., Room 28, Boston, Mass.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Treatise on the Steam Engine Indicator. Price $1. Address, E. Lyman, C. E., New Haven, Conn.

Universal grinders for lathe-centers, chucks, angles or cylinders. C. C. Hill, room 8, Ulich Block, Chicago.

Machine Designing and General Engineering work done by T. J. Winans, 54 M. & E. R. R. Ave., Newark, N. J.

A handsome monthly journal sent free to engineers and mechanics the year round. Send postal for it to Money Saver, 95 Liberty street, New York.

Steel Forgings, either plain or crank, up to 10,000 lbs. in weight. Address, Pennsylvania Steel Co., 160 Broadway, New York.

Light and fine interchangeable machinery to order. Foot and power lathes, slide rests, &c. Catalogue for stamp. Edwd.O.Chase, Newark, N.J.

One hand bookbinder's embossing press for sale. Size of platen, 16" x 24". In first-class order. Ohl & Co., E. Newark, N. J.

New Year's Present—"The Complete Practical Machinist," by Joshua Rose, 440 pp. 196 illustrations. $2.50 postpaid. Address, P. O. Box, 3,306 N. Y. City.

Boring Bars made all sizes for all purposes to bore both straight and taper work. Pedrick & Ayer, proprietors, L. B. Flanders' Machine Works, 1025 Hamilton street, Philadelphia, Pa.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

Free—"Useful Hints on Steam." A book of 96 pages, illustrated. Valuable to engineers, steam users and those about purchasing steam machinery. By mail, 15 cents, or free on personal application. E. E. Roberts, 107 Liberty St., New York City.

The Theoretical and Practical Boiler Maker, 335 pages, and 37 lithograph plates. Published by the author, S. Nicholls, Yorkshire street, Blackpool, England. Mailed on receipt of P.O.O value $1.83, to Blackpool. See Review, AMERICAN MACHINIST, p. 8, July 22, 1882.

MANUFACTURES.

The Yougstown, O., Car Works are receiving plenty of orders to keep their large establishment running full time.

The Monongahela Manufacturing Company, a new organization, has bought the engine and machine shops of Morrison, Abrams & Co., at Monongahela City, Pa., paying $10,000 therefor.

The Defiance Machine Works, Defiance, Ohio, manufacturers of hub, spoke and wheel machinery, etc., have just completed a new brick machine shop 44x132 feet, with 3 stories and basement, and have added a quantity of new machinery.

The Missouri Car and Foundry Company, St. Louis, have all of their new buildings up and covered in except the carpenter shop. They expect to be in full running order in all departments within a week.

It is stated that the construction of railway material in Germany absorbs nearly one-third of the iron and steel production of that country. This is in a great measure due to the considerable development of the foreign trade, especially in rails.

It is rumored that the "Novelty Iron Works of New York" are about to establish a branch establishment in New London, Ct., that the company has purchased property, including the three valuable wharves, and that the work of erecting large workshops will soon begin.

James Jenks, manufacturer of injectors, ejectors and lubricators, Detroit, Mich., writes us: My business for the year just closed shows an increase of nearly 70% over 1881, and from the present outlook it bids fair to increase as much in 1883 as in 1882. The Duplex injector is winning its way in the market to my entire satisfaction.

Sweetland & Co., New Haven, Conn., write us: For the year 1882 the sale of the Sweetland chuck in this country and abroad, was good. We have in the past year increased our facilities for manufacturing, about one-third. Respecting the future, would say that we anticipate a reasonable share of the chuck trade.

The first two engines built by the New York Locomotive Works, Rome, N. Y., were intended to haul freight. They were sent to the N. P. R. R., have been fitted with air brakes and will be used for passenger trains. Most of the employes of the works are kept busy until 10 o'clock every night on account of the press of orders for locomotives. The success of the works seems already assured.

The Stevens, Turner & Burns Co., London, Ont., are enlarging their already extensive machine shops, and report prospects excellent for trade during the year 1883.

The Brush Electric Co., of Cleveland, Ohio, have ordered from H. B. Beach & Son, of Hartford, Conn., a 100-horse power boiler to be set with Mahoney's patent furnace improvements. His patent corrugated grate bars will also be used.

The Harrison Boiler Works, now located at Germantown Junction, Philadelphia, have recently furnished a Harrison boiler to Wm. Sellers & Co., of Philadelphia, this being the sixth boiler of that type furnished to that establishnent.

The Southwark Foundry and Machine Co., of Philadelphia, are furnishing a pair of 44″x60″ reversing engines of extra massive proportions, to the Cambria Iron Co. These engines are intended for rolling steel ingots 18″ square, believed to be the largest ingots so far rolled in this country.

E. E. Garvin & Co. (Machinists' Tools', 139 and 141 Center street, New York, write us: Our orders keep us very busy with a force of 130 men. Have brought out some new machines during the past year. We are now putting the electric light into our shop. Prospects for 1883 are good.

Warner & Swasey, Cleveland, Ohio, write us: The business of the past year has been excellent with us, and we are now running our full force (35 men) on brass making machinery, of which we make comple outfits for manufactories. Present orders indicate a good year's business.

The Lidgerwood Manufacturing Company, 96 Liberty street, New York, and the Westinghouse Machine Company, 92 Liberty street, New York, have recently placed agencies for their goods in the hands of the Hendrie & Bolthoff Manufacturing Company, Denver, Col.

The Southwark Foundry and Machine Co., 430 Washington Ave., Philadelphia, have issued a blue print copy of a letter written by Homer Baldwin, of Youngstown, to a milling concern in Mankato, Minn., detailing four years' experience with the Porter-Allen engine.

M. T. Jones, 97 Liberty street, New York, has recently set two boilers in the treasury building at Washington, with his improved boiler setting, and will at once set a 7 foot boiler for Stephens & Thompson, of North Hoosic, N. Y.; also two boilers for Sheldon & Sons, West Rutland, Vt. This being his fourth order from the last named firm.

Williams & Kemp, Baltimore, Md., started a small machine shop last April, with a few good tools and, as they say, "a determination to do the best work." They make steam engine repairs a specialty and have succeeded even beyond their expectations. The engines they have repaired are giving excellent satisfaction. They are now making patterns to build a 4-horse power upright engine with a balanced box valve, which will not require packing in the steam chest bonnet and valve stem. The parts will all be accessible.

The Syracuse Iron and Tube Company, of this city, says the Syracuse *Evening Herald* of Jan. 10, was incorporated about two years ago with a capital of $100,000, and built extensive works at the corner of Pine, Water and Washington streets. The machinery has been working the past two months. At the recent annual meeting in this city they elected for Directors, E. F. Holden, J. M. Ward, W. E. Abbott, S. A. Seager, N. C. Ryder, William Niven, William T. Hamilton, D. Collins and Andrew Telfer. N. C. Ryder was elected president, Willis A. Holden, secretary and treasurer, and Andrew Telfer general superintendent. The Onondaga Tube Company, is the name of a new joint stock organization formed in this city for the manufacture of iron of every kind and description and tubes of all sizes and kinds. The capital stock is only $25,000. The corporation dates from to-day, and is for fifty years. The incorporators and first three trustees are H. N. Loomis, Waterman C. Bradley and Edward N. Westcott. The company have not yet decided in what part of the city their works will be located. They are negotiating for the purchase of suitable property.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 18, 1883.

The market for supplies does not exhibit any new features developed since our last report. Buyers seem inclined to withhold their orders until something more definite is known in regard to a scale of prices. There is a fair amount of business being transacted, with a good outlook for the future.

The rubber manufacturers met in this city yesterday. There were about thirty-five persons present, representing twenty-nine manufactories, which was a very full representation. An effort was made to combine the manufacturers in the form of a company to purchase the crude material, but was unsuccessful after a long discussion The holders of the raw material are endeavoring to keep prices up, but by refusing to sell they are losing heavily.

Schaffer & Budenberg, 40 John street, New York, have just received an invoice of a full line of their new Exhaust Injectors for working against boiler pressures of 300 pounds per square inch and downwards. These injectors are arranged to use a small quantity of live steam direct from the boiler while those required for pressures below 90 pounds work reliably with exhaust steam alone.

James Beggs & Co., 9 Dey street, have just taken an agency for the Geo. C. Taft Blacksmith's Drills, for New York and vicinity. A full line of these drills will be kept in stock.

Iron and Metal Review.

The demand for Pig Iron continues light and stocks are gradually accumulating to such an extent that some of the furnaces talk of blowing out unless prospects for the future should brighten very soon. Consumers are reluctant in contracting for their yearly supply in advance, and still look upon the future with apprehension.

We quote Foundry No. 1, $24 50 to $25. Foundry No. 2 X, $23 to $23.50. Grey Forge, $19 to $20.

The sales of Foreign Iron since our last report have been small and prices low. Special concessions have not seemed to bring buyers, showing that there is an indifference in the matter of stocking up.

We quote Coltness at $25.50 to $26; Glengarnock, $22.50 to $23; Gartsherrie, $25 to $25.50; Summerlee, $24.50 to $25; Carnbroe, $22; Eglinton, $21.50 to $22; Langloan, $25.50.

Wrought Iron Scrap is in fair demand at $27 from yard. Parcels ex. ship $26 to $26.50. Steel Rails are still quoted at $40 at the mill.

The inquiry for Old Rails continues small. Double Heads being held at $28 to $28.50, and Tees at $26. The market for manufactured iron is dull.

The market for Copper continues dull, with prices feverish, which we quote at 17c. to 17⅛c. Banca Tin, 28c; Straits and Malacca, 21¼c. to 21⅜c.; Australian and Billiton, 21⅛c.; English Lamb and Flag, 22¼c.; Spelter, Common Domestic, 4¾c. to 5c.; Refined 8c. to 8¾c.; Silesian, 5c. to 5¼; Lead, 4.65c. to 4 70c.; Antimony, Hallett's, 10¼c. to 10⅜c.; Cookson's, 11¼c. to 11⅜c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A draughtsman well up in Sugar machinery, both for plantation and refinery work. Address, Z, AMERICAN MACHINIST office.

Situation wanted by a first-class engineer, to take charge of high or low-pressure engines. Address, Practical Engineer, office AMERICAN MACHINIST.

Wanted—A good man to act as foreman in a brass shop, manufacturing specialties. Address, James Jenks, Detroit, Mich.

Wanted—A situation by a thorough, experienced machinist. Dies, small tools and special machinery. West preferred. Address, W. L., AM. MACHINIST

Wanted—Several first-class vise hands who have been accustomed to do fitting on machine tools, must be sober and steady men. Address, Jos. B. Reed, Cairo, Ill.

Wanted—Situation as foundry foreman. Thirty years' experience, fifteen as foreman. Accustomed to all kinds of work, both light and heavy, core making and melting. Address, B., Lock Box 176. Holyoke, Mass.

Wanted—Situation by a young man who is a first-class hand on the Brown & Sharpe Universal Miller; also is a good tool maker and general machinist. Four years experience a foreman. Out of the city preferred. Address, Milling, care AMERICAN MACHINIST.

Wanted—by a Western machinery establishment a good clear-headed, reliable draughtsman; married man preferred. Must be accurate, fairly rapid, and competent to watch his work through the shop. Permanent situation and good pay to the right man. Address, BOX 5, AMERICAN MACHINIST office.

Wanted a good second-hand horizontal engine, fifty to seventy-five horse-power. Must have cut-off, and be in good condition. Address, J. G. Harrison, 169 Fourteenth street, Jersey City, N. J.

PATENT
Self-Oiling Loose Pulley,
Fully tested by several years use and found reliable.
Satisfactory Results Guaranteed, if Directions are followed.
ORDERS FILLED FOR PULLEYS
From 6 in. to 20 in. Diameter.
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MANUFACTURERS SHAFTING, ENGINES, BOILERS, SAW MILLS, AND GENERAL MACHINERY.

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With Immediate Deliveries,
8 new "first-class" 6 flue boilers, 50″ diameter by 18′ long; 12 6″ flues in each; manholes in each end; wrought iron lower connection to mud drums; steam and mud drums 30″ diameter, suitable lengths; 6 ft. stack iron and breecher. Boilers arranged for 2 batteries of 4 each; extra 30″ steam dome to connect the two; stack in centre resting on separate brick-work; all could be arranged for one battery: fire fronts and all fixtures if wanted.
Also, 3 new, first-class 2 flue boilers, 44″ diameter by 18′ long; flues 14″ diameter; steam and mud drums, and all fixtures. 18″ by 20″ high speed engine, with machinery complete for 1 circular mill and 3 shingle machine mills, including all shafting, pulleys, etc. Plans and specifications, with prices, furnished by
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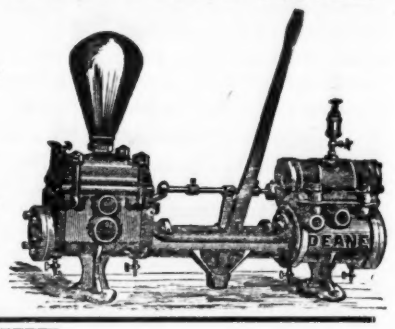
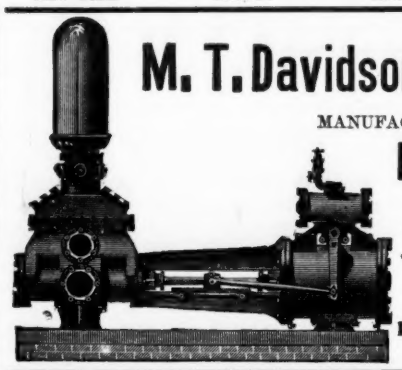


THE
M. T. Davidson Improved Steam Pump,
MANUFACTURED BY
Davidson Steam Pump Co.,
OFFICE & WORKS:
41 to 47 KEAP STREET, BROOKLYN, N. Y.

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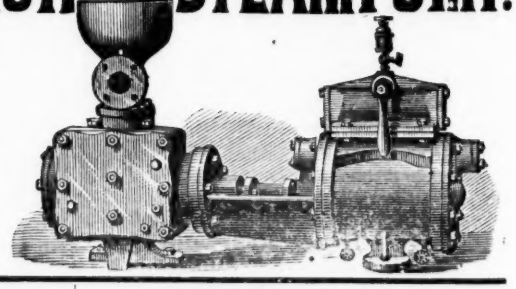

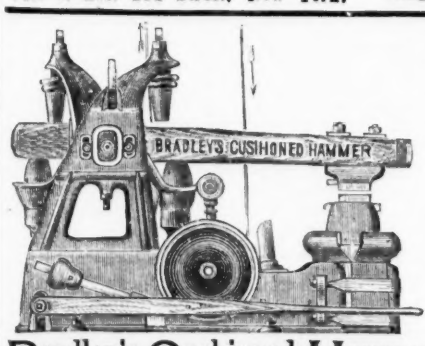

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OVER 700 IN USE.
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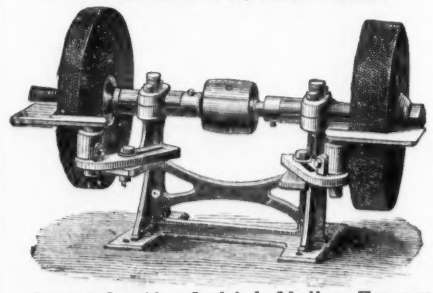
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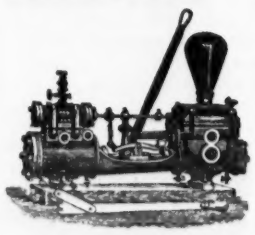

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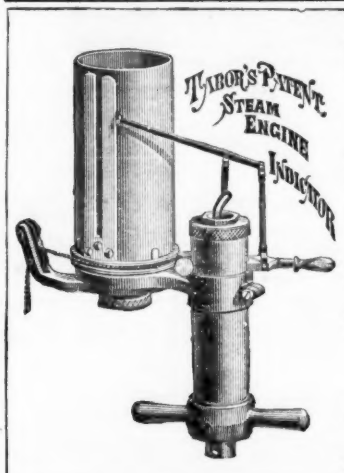

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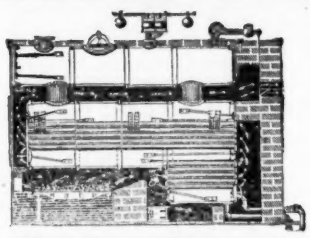

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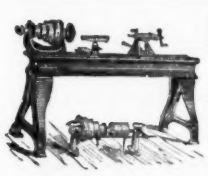

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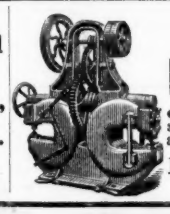

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PATENT HOT POLISHED SHAFTING.

Superior to any shafting in market for the following reasons, viz.: 1st.—It is perfectly straight and round. 2d.—It can be rolled accurately to any desired gauge. 3d.—It has the beautiful blue finish of Russia Sheet Iron, rendering it less liable to rust or tarnish than shafting of the ordinary finish. 4th.—It will NOT SPRING or WARP IN KEY SEATING like most of the other manufactured shafting sold in the market, and, as a consequence, is admirably adapted for LINE AND COUNTER SHAFTING. 5th.—The surface is composed of MAGNETIC OXIDE OF IRON, forming a superior journal or bearing surface. 6th – It is made of superior stock.

Sizes made from 7/8 to 3 15/16 inches, advancing by sixteenths. Price lists, with references and other information, furnished on application to

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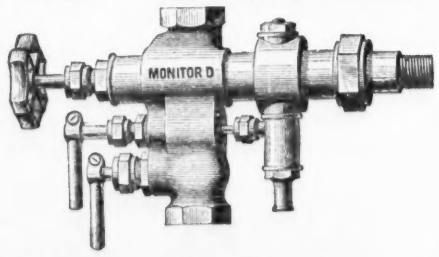

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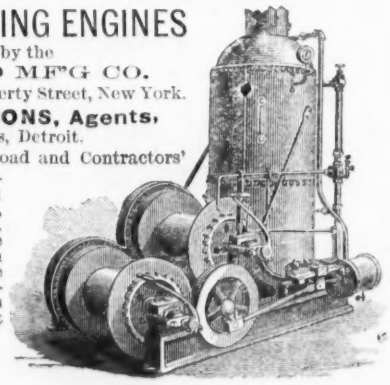

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" 10	1 1-2	"	1 10
" 11	1 3-4	"	1 25
" 12	2	"	1 40
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Full set, 19 Dogs, 26.35

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Small set of 8 dogs from 3-8 to 2 ins., $7.30.

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When ordering, state as above, whether a full set or a set of 12, or small set of 8. Users of these dogs prefer them to any other make.

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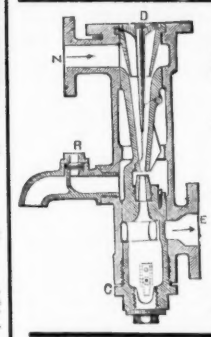

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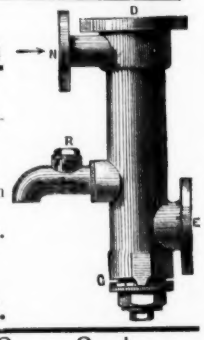

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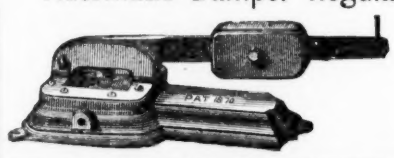

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New Catalogue free. Address,

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REVOLVING HEAD SCREW MACHINES

WITH PATENT AUTOMATIC WIRE FEED.

Of Extra Strength and Power, of a Superior Design and Finish.

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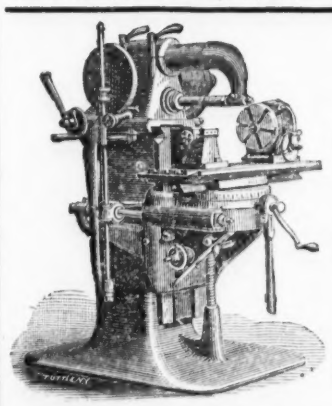

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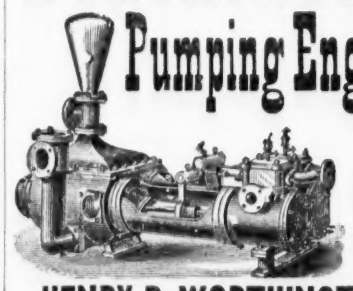

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TESTIMONIAL
ON THE MERITS OF THE
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AUBURN, N. Y., July 24, 1882.

HANCOCK INSPIRATOR CO.,
25 Beach St., Boston, Mass.

DEAR SIRS:

It gives us pleasure to say to you that we have used your No. 10 Inspirator exclusively for the past two years, on our portable boilers, and we pronounce them the best boiler feeder for portable use we have ever seen. We have never had any complaints from our customers; on the other hand, they prefer them to anything else. We are using your Locomotive Inspirators with equal success on our Traction Engines.

Yours respectfully,

THE E. M. BIRDSALL CO.

This Company are using over 300 No. 10 Inspirators this year.

NOTICE.

The Hancock Inspirator Co. have issued a neat card, about 13 x 20 inches, for computing the wages of workmen.

It shows at a glance the amount of a man's wages for any number of even hours, or fractional hours. Thus: 56¾ hours at 27½c., shows result, $15.61. It includes the ruling rates per hour, and will prove quite a help to any factory, shop, or company who pay their help weekly, by the day or hour.

We will mail it to any parties (outside of New England,) to whom it would be useful, on receipt of ten cent stamp for postage. Address,

THE HANCOCK INSPIRATOR CO.,
34 Beach St., Boston, Mass.

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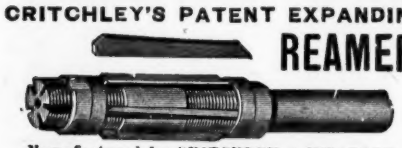

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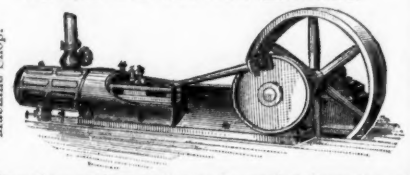

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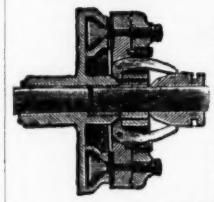

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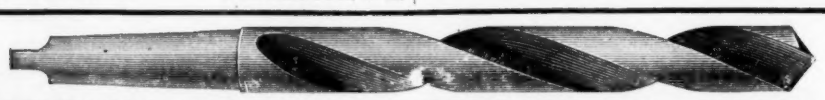

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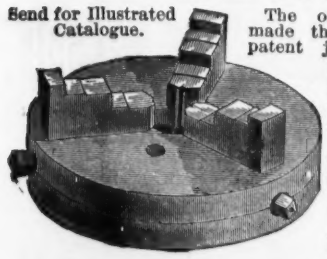

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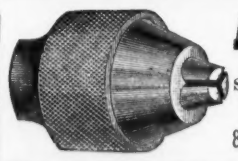

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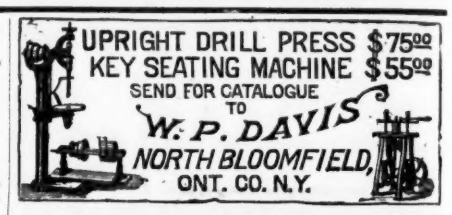

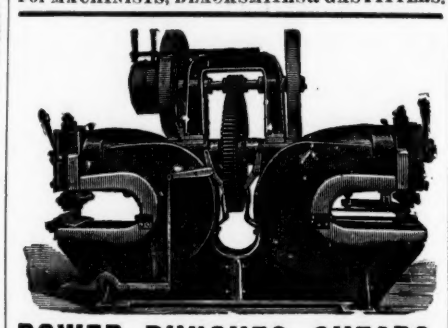

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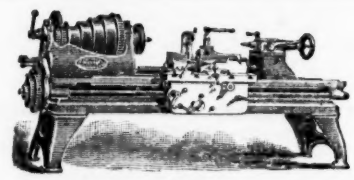

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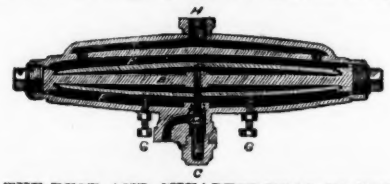

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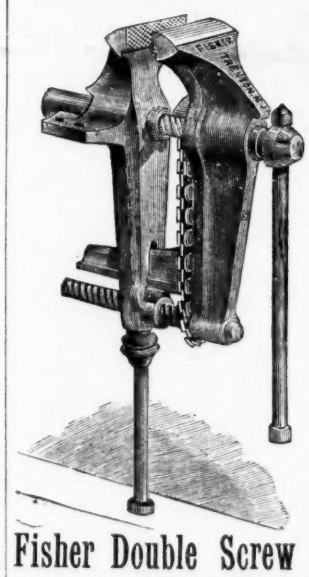

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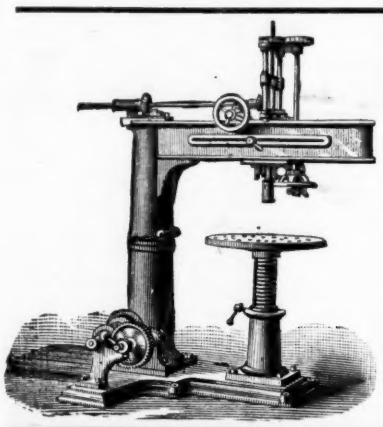

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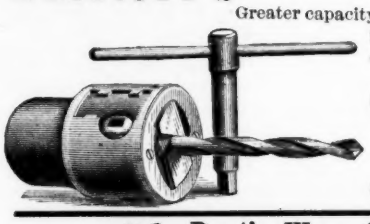

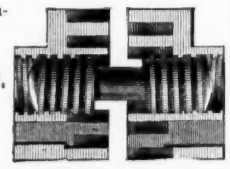

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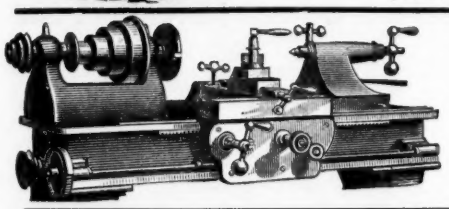

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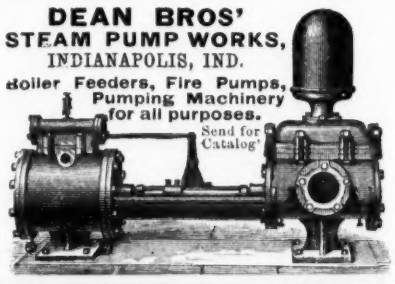

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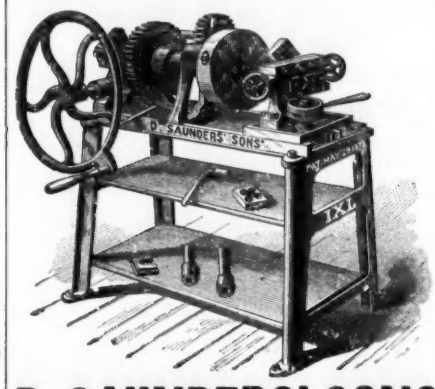

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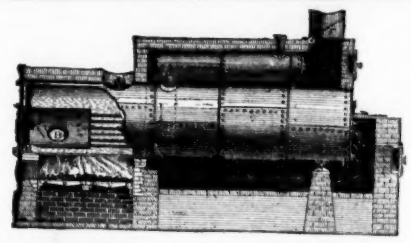

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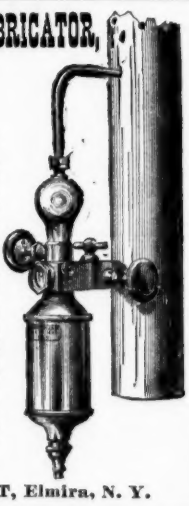

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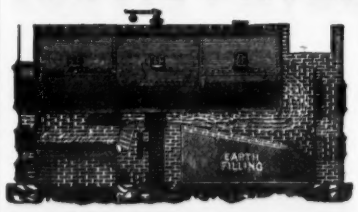

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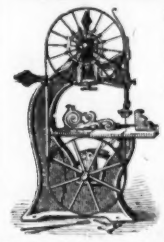

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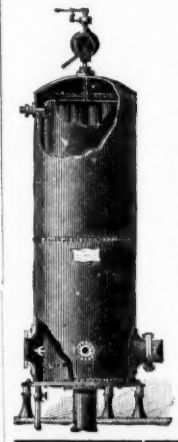

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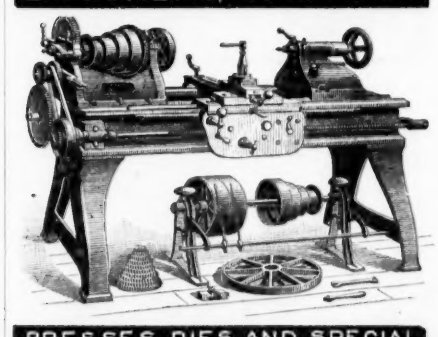

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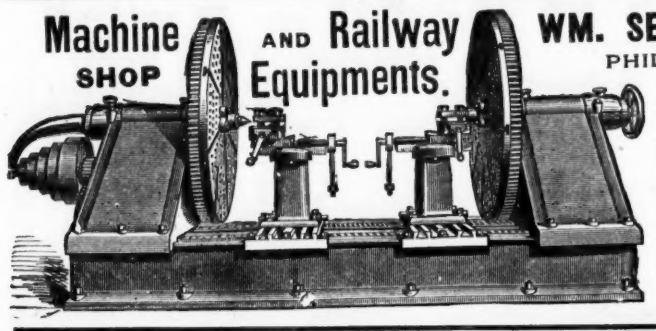

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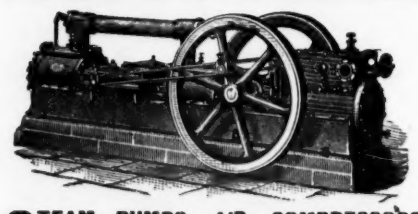

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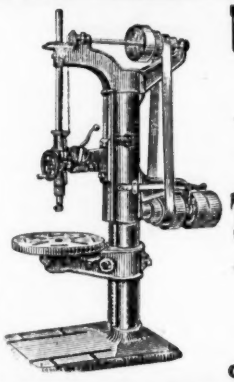

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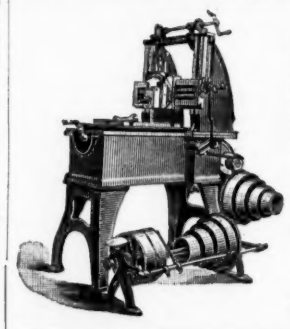

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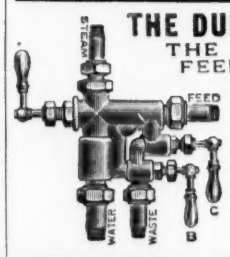

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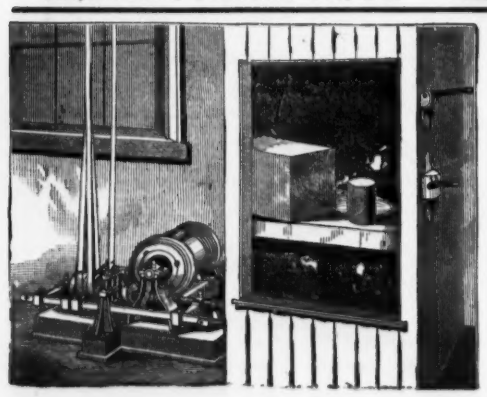

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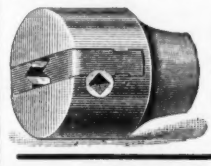

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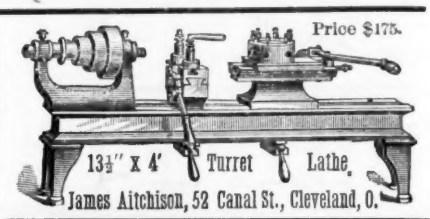

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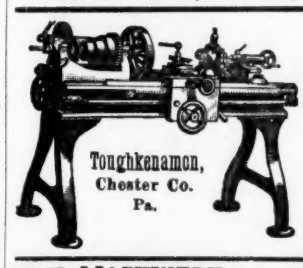

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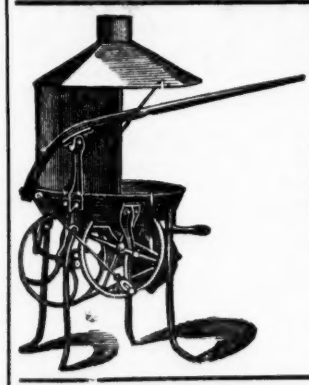

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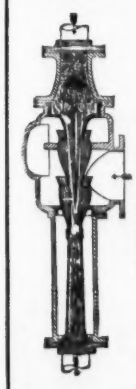

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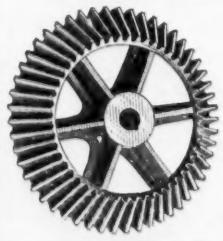

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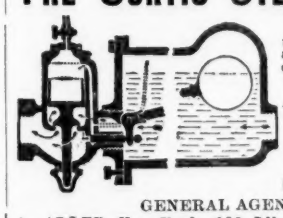

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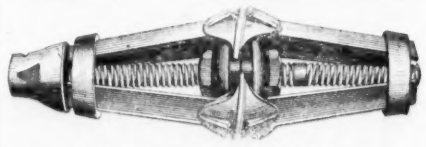

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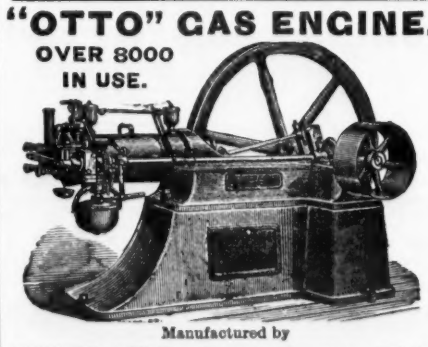

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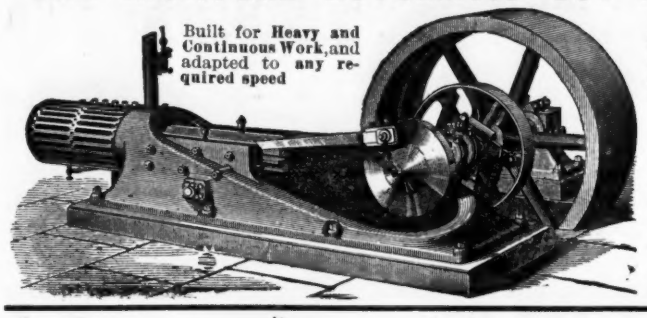

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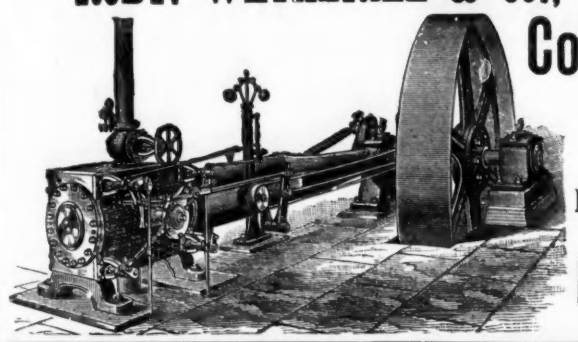

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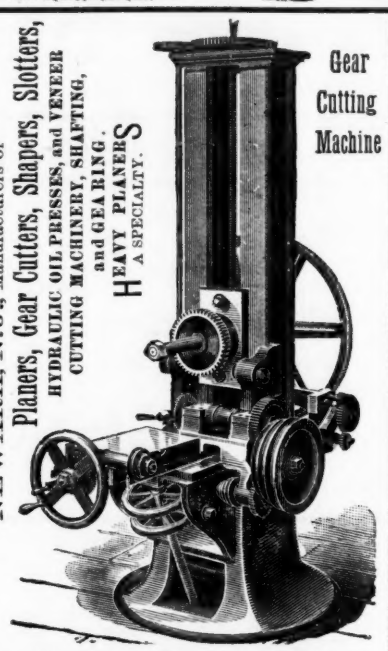

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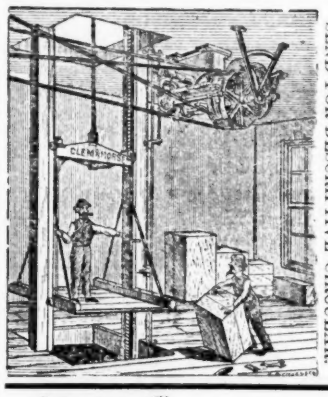

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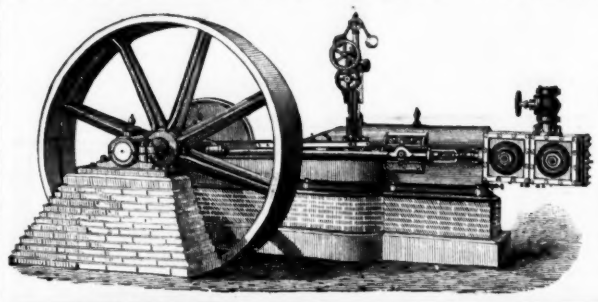

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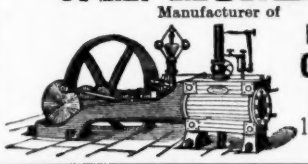

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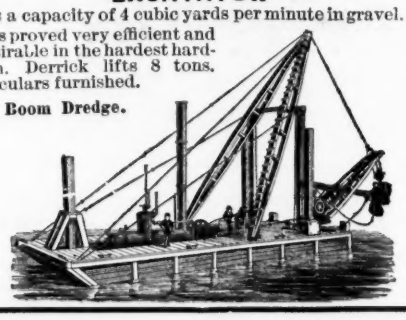

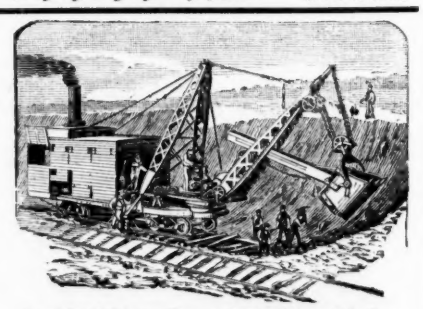

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1 36 " 22½ " " "
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1 Iron Planer, 54 inch x 42 inch x 17 feet.
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1 " " 36 " 36 " 13 " New.
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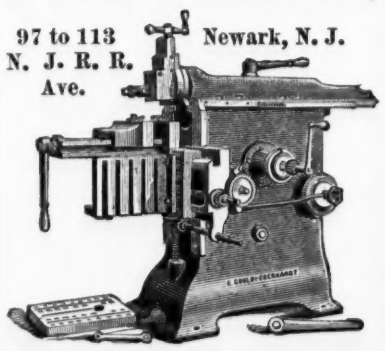

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1 42 in. " 16 ft. " " " " 15,
1 36 in. " 18 ft. " " " " 15.
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1 New Corliss Engine, 16 in. x 42 in. Complete in four weeks. The following on hand:
1 New Corliss Engine, 12" x 36". Complete.
1 " 26 in. swing, 12 ft. bed, New Engine Lathe.
1 each, 30 in. " 14, 16 & 18 ft. bed. " "
1 60 in. swing, 24 ft. bed, New Engine Lathe.
2 22 in. " 12 ft. " " " "
2 19 in " 10 ft. " " " "
4 18 in. " 8 ft. " " " "
5 15 in. " 6 ft. " " " "
1 10 in. " 5 ft. " " " "
1 30 in. " 12½ ft. " " " "
1 26 in. swing, 14 ft. bed. " " "
1 12 in. swing, 6 ft. Hand Lathe.
1 10 in. " 4½ ft. Bed Hand Lathe.
1 40 in. x 10 ft. Iron Planer.
1 38 in. x 12 ft. " "
1 32 in. x 8 ft. " "
1 26 in. x 6 ft. " "
2 30 in. x 8 ft. " Planers.
2 22 in. x 4 ft. " "
2 38 in. Swing Upright Drills. B. G. & S. F.
1 23 in. Drill. B. G. & S. F.
1 22 in. " Upright Drill. B. G. S. F.
1 23 in. & 3, 20 in. Drills. Plain.
1 18 in. Bench Drill.
1 each, 3 & 4 Spindle Drill.
1 Double Nut Tapper. Horizontal.
1 12 in. stroke Slotting Machine.
2 each, 12 & 15 in Shapers.
2 12 in stroke Shapers, traveling head, 40 in. traverse double tables.
2 4½ in. Hyde's Pat. Centering Machines.
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90 Foot Presses. 1, 00 Fowler Press. 1 Foot Punch, with bench. 1 Railway Saw Bench.
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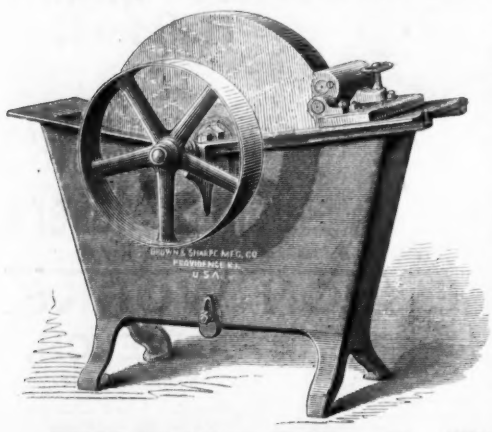

This cut represents a grindstone trough combining a number of very desirable qualities. In addition to the ordinary arrangement of trough, spindle, and pulley, it is provided with self-oiling boxes and an adjustable truing device which can be instantly applied to the face of the stone, working automatically, and without dust, keeping the face of stone always in good shape without interfering with its constant use.

DIRECTIONS.—The stone should revolve so as to have the device upon the face which moves upwards. The main stand or bottom piece of the device is securely clamped upon the trough close to the face of the stone, then by turning the hand wheel the threaded roll is brought into contact with the face of the stone and allowed to remain as long as is requisite to produce the desired result. The water is to be left in the trough as usual. When by long use the thread on the hardened roll becomes worn, it can be re-cut, which operation may be repeatedly performed.

Weight 600 pounds; with 40-inch stone, 1,000 pounds.

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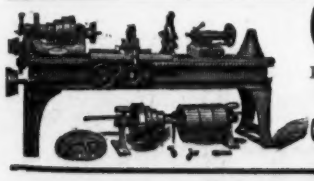

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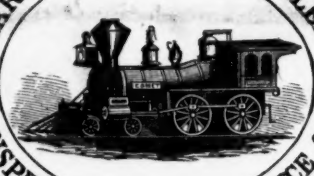

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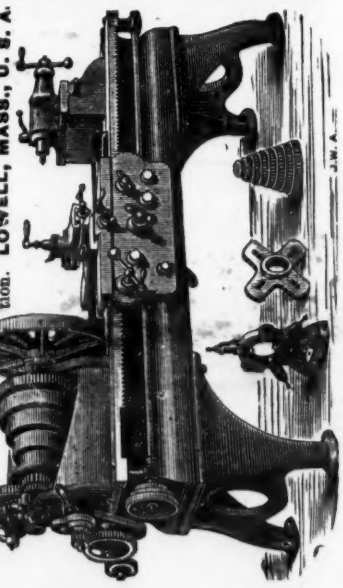

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